OCT 15 1917
UNIV. OF MICH.
LIBRARY

BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL

Entered as Second-Class Matter at the Baltimore, Maryland, Postoffice.

Vol. XXVIII.—No. 320.] BALTIMORE, OCTOBER, 1917. [Price, 50 Cents

CONTENTS.

PAGE

The Effects of Serum Therapy in Acute Lobar Pneumonia.
By Arthur Bloomfield 301

A Study of the Incidence of the Types of Pneumococci Isolated from Acute Lobar Pneumonia and Other Infections, and an Analysis of the Cases Classified by Types in Regard to Mortality, Complications, Associated Diseases, Bacteriemia, and Leucocytosis.
By Mildred C. Clough, M. D. 306

An Epidemiological Study of Lobar Pneumonia. (Illustrated.)
By Virgil P. W. Sydenstricker and Alan C. Sutton . 312

A Study of the Bacteriæmia in Lobar Pneumonia. (Illustrated.)
By Alan C. Sutton and Charles E. Sevier 315

On the Mechanism of Convulsive Phenomena and Allied Symptoms.
By C. Macfie Campbell, M. D. 318

The Fasciolopsimæ of China: A Study of Two Species from Chekiang Province. (Illustrated.)
By N. Worth Brown, M. D. 322

Proceedings of Societies.

The Johns Hopkins Hospital Medical Society. 329
Exhibition of Case of Cerebro-Spinal Meningitis [Dr. V. P. W. Sydenstricker];—(a) Absorption of Drugs Through the Eye. (Abstract.) [Dr. D. I. Macht];—(b) Truth and Poetry Concerning Hydrastis. (Abstract.) [Dr. D. I. Macht];—Subacute Streptococcus Endocarditis in the Bacterial and Bacteria-Free Stages [Dr. E. Libman];—The Growth of Bacillus Coli in Urine at Varying Hydrogen-ion Concentration. (Abstract.) [Dr. A. T. Shohl and Mr. J. H. Janney];—Acidosis [Dr. L. J. Henderson];—A Summary of End-Results in the Treatment of Cases of Pelvic Abscess by Vaginal Incision and Drainage [Dr. Lawrence Wharton];—Observation on the Degeneration of Leucocytes in the Urine as a Diagnostic Aid in Tuberculosis of the Urinary Tract in Women [Dr. H. M. N. Wynne];—Treatment of Leucorrhœa [Dr. H. N. Shaw];—A Case of Saphenous Varix Simulating a Femoral Hernia [Dr. E. H. Richardson];—Hematomata of the Ovary Including Corpus Luteum Cysts [Dr. Emil Novak];—Stricture of the Ureter. Report of 100 Cases [Dr. H. M. N. Wynne];—Demonstration of a Simple Method for Determination of Venous Pressure [Dr. N. Worth Brown];—Demonstration of Spontaneous Rhythmic Contraction of Arteries [Dr. H. B. Richardson and Dr. E. A. Park];—A Hitherto Undescribed Sporotrichum [Dr. W. R. Sisson];—(a) Studies on Disturbances of Thyroid Function, with Special Reference to Thyroid Adenomata. (b) Adrenalin Hypersensitiveness in Hyperthyroidism [Dr. Emil Goetsch].

The Johns Hopkins Hospital Historical Club. 331
Presentation of the Medallion Portrait of Dr. Rupert Norton. Presentation on Behalf of Mrs. Norton by Dr. W. S. Thayer. Acceptance for the Trustees of the Hospital by Hon. Henry D. Harlan. Closing Remarks by Dr. William H. Welch;—Johns Hopkins and Some of His Contemporaries [Dr. Henry M. Hurd];—Giovanni Maria Lancisi: Clinician, Pathologist, Epidemiologist. (Abstract.) [Dr. John Foote];—The Gods of the Underworld in Ancient Medicine. (Abstract.) [Dr. H. F. Garrison].

The Laennec Society. 333
X-Rays in Tuberculosis: The Roentgen Diagnosis of Pulmonary Tuberculosis [Dr. Henry K. Pancoast];—A Comparative Analysis of Roentgen Ray Pictures, Physical Signs and Symptoms in Pulmonary Tuberculosis [Dr. F. H. Heise and Mr. H. L. Sampson];—Tuberculosis as a Social Problem: The Public Health Work of a Great Life Insurance Company [Dr. Horace John Howk];—The Social Service Side of Tuberculosis Work in New York [Dr. James Alexander Miller].

Books Received 334

An Appeal to the Medical Profession of the United States. . 334

THE EFFECTS OF SERUM THERAPY IN ACUTE LOBAR PNEUMONIA.

By Arthur Bloomfield.

(From the Medical Clinic of The Johns Hopkins Hospital.)

Through the courtesy of the Rockefeller Hospital which has supplied us with Type I antipneumococcus serum,* it has been possible during the past winter to employ specific serum therapy in a series of cases of acute lobar pneumonia. Although the number is too small to allow definite conclusions as to the efficacy of the serum as a life-saving measure, certain observations of interest were made which are herewith put on record. They comprise studies of (1) the course of the septicemia in treated cases, (2) the changes in the agglutinins of the patient's serum, and (3) the serum reactions of a dangerous or undesirable nature.

Eleven cases were studied. They were all instances of frank lobar pneumonia, in which the Type I pneumococcus

* Cole, R. I. New York Medical Journal, 1917, CV, 223. Arch. of Int. Medicine, 1914, XIV, 56.

was demonstrated in the sputum or blood. Nearly all the patients were colored laborers and came in with the disease well advanced—thus presenting conditions unfavorable to treatment. In addition to the serum, hydrotherapy, digitalis, and symptomatic measures were employed.

The pneumococcus was usually isolated from the sputum by mouse inoculation, and the type determined by agglutination with stock immune sera. The serum was warmed to body temperature and injected intravenously by gravity, at the rate of 2 to 4 c. c. a minute. A preliminary desensitizing dose of 1 to 5 c. c. was given subcutaneously or intravenously. Blood cultures were made before and after treatments, and samples of blood were drawn for the agglutination tests.

The results are presented in the following protocols:

CASE 1.—E. T. (Med. No. 37609), colored, aged 21. Admitted on about the 7th day of the disease with consolidation of the entire right lung. General condition good.

Date.	Hour.	Serum.	Pneumococci per c. c. of blood.	Agglutinins. 1:1	1:2	1:4	1:8
Mar. 2 7th day	10.00 a.m. 11.30 p.m.	Admitted to ward. 1 c.c. subcutaneously.	 0	....	....	....	....
Mar. 3 8th day	12.15 a.m. 4.30 p.m.	100 c.c. intravenously. 100 c.c. intravenously.	 0	....	....	....	....

Clinical Course.—The patient was admitted on about the 7th day of a moderately severe pneumonia with consolidation of the right lung. On the 8th day 200 c. c. of serum were given with gradual fall of temperature and pulse to normal during the two following days. On the 11th day there was a secondary rise of temperature to 101° F. which continued for about six weeks, the signs in the lung slowly clearing during this time.

No serum reaction of any sort was observed.

CASE 2.—W. J. (Med. No. 37225), colored, aged 21. Admitted on about the 8th day with consolidation of the right upper and middle lobes. General condition good.

Date.	Hour.	Serum.	Pneumococci per c. c. of blood.	Agglutinins.* 1:1	1:2	1:4	1:8
Jan. 29	9.00 p.m.	Admitted to ward.	....	....	....	....	....
Jan. 30 9th day	11.00 a.m. 12.00 noon 1.00 p.m.	1 c.c. subcutaneously. 100 c.c. intravenously.	0	+++ .... +++	++ .... ++	+ .... +	0 0
Jan. 31 10th day	12.15 a.m. 1.00 a.m. 2.00 a.m. 9.00 p.m. 10.00 p.m. 11.00 p.m.	..... 100 c.c. intravenously. .... 100 c.c. intravenously.	.... 0	+++ .... ++++ ++++ .... ++++	++ .... +++ +++ .... +++	+ .... ++ ++ .... ++	0 .... 0 ++ .... ++

* 1: 1 = Equal parts of serum and bacterial emulsion. ++++ = Complete agglutination. 0 = No agglutination.

Clinical Course.—The patient was admitted on about the 8th day of a mild pneumonia with consolidations of the right upper and middle lobes. During the next two days 300 c. c. of serum were given. Crisis took place on the 10th day and convalescence was uneventful.

No early or late reaction to serum was observed.

CASE 3.—M. S. (Med. No. 37423), white, aged 48. Admitted on 5th day of the disease with consolidation of the right upper lobe. General condition fairly good.

Date.	Hour.	Serum.	Pneumococci per c. c. of blood.	Agglutinins. 1:1	1:2	1:4	1:8
Mar. 1 5th day	6.00 p.m.	Admitted to ward.	....	....	....	....	....
Mar. 2 6th day	11.50 p.m.	1 c.c. subcutaneously.	0	....	....	....	....
Mar. 3 7th day	12.30 a.m. 10.00 p.m.	100 c.c. intravenously. 100 c.c. intravenously.	0 0	....	....	....	....
Mar. 4 8th day	8.00 p.m.	100 c.c. intravenously.	0	....	....	....	....

Clinical Course.—The patient was admitted on the fifth day of a severe pneumonia with consolidation of the right upper lobe. Three injections of 100 c. c. each were given on the 7th and 8th days. Each injection was followed by a fall of temperature of several degrees with a subsequent rise a few hours later. The temperature and pulse became normal on the 9th day, and remained so except for slight post-critical rises. There was no spread of the pneumonic process in the lung.

Serum Reactions.—No immediate reaction followed any of the injections. On the 13th day—six days after the first injection—a large urticarial patch appeared. Two days later an intense generalized erythematous and urticarial eruption appeared and continued for five days. There were no other manifestations of serum sickness. Discharged well on the 27th day of the disease.

CASE 4.—F. S. (Med. No. 37698), colored, aged 18. Admitted on 4th day of the disease with consolidation of the right lower lobe. General condition good.

Date.	Hour.	Serum.	Pneumococci per c. c. of blood.	Agglutinins. 1:1	1:2	1:4	1:8
Mar. 31 4th day	6.00 p.m.	Admitted to ward.	....	....	....	....	....
April 1 5th day	12.00 noon 1.00 p.m. 2.00 p.m.	5 c. c. intravenously. 100 c.c. intravenously.	0 0	0 .... ++++	0 .... ++++	0 .... ++++	0 0
April 2 6th day	5.00 p.m. 6.00 p.m.	100 c.c. intravenously.	0	.... ++++	.... ++++	.... ++++	.... ++++
April 3 7th day	3.00 p.m. 4.00 p.m.	100 c.c. intravenously.	0	.... ++++	.... ++++	.... ++++	.... ++++

Clinical Course.—The patient was admitted on the 4th day of a moderately severe pneumonia with consolidation of the right lower lobe. On the 5th day 100 c. c. of serum were given, the injection being followed by a sharp drop of temperature to normal with a subsequent rise. On the 6th day and on the 7th day 100 c. c. were given, after which the temperature fell and the symptoms cleared. From the 7th to the 20th days there was low fever with occasional sharp rises. With one of these on the 15th day there was a profuse crop of urticarial wheals, which recurred for about a week. On the 16th day there were severe pains in the joints. This serum reaction, in summary, lasted from the 13th to the 20th day. From the 20th to the 24th day the temperature was normal and the patient seemed perfectly well. On the 24th day there was a sudden rise of temperature to 103° F., high fever persisting for three days and then falling critically. During this period there were urticaria, joint pains, and adenitis.

Uneventful convalescence without further complications.

CASE 5.—L. G. (Med. No. 37611), colored, aged 24. Admitted on the 3d day of the disease with consolidation of the left upper lobe. General condition good.

Date.	Hour.	Serum.	Pneumococci per c. c. of blood.	Agglutinins. 1:1	1:2	1:4	1:8
Mar. 24	6.00 p.m.	Admitted to ward.	....	....	....	....	....
Mar. 25 4th day	1.30 p.m.	1 c. c. subcutaneously.	0	....	....	....	....
	2.30 p.m.	100 c. c. intravenously.	0	....	....	....	....

Clinical Course.—The patient was admitted on the 3d day of a moderately severe pneumonia with consolidation of the left upper lobe. On the 4th day 100 c. c. of serum were given. No more serum was given on account of the reaction following the first dose. The course of the disease seemed to be uninfluenced by the serum, lysis occurring during the 7th, 8th and 9th days. Daily blood-cultures were all sterile, and there was no spread of the pneumonic process to other lobes.

Serum Reactions.—There was no reaction to the desensitizing dose of 1 c. c. The intravenous dose of 100 c. c. was followed in a few minutes by a fulminating immediate reaction. There was extreme cyanosis and dyspnœa; the chest was filled with rales, the patient frothed at the mouth, the pulse was extremely rapid and feeble; there were nausea, vomiting, and loss of sphincter control. This reaction was controlled to some extent by adrenalin and atropin, but one hour after the start there was a profuse general urticaria which persisted for about 24 hours.

From the 9th to the 15th day the temperature was practically normal and the patient felt well. On the 11th day there was a transient urticaria; on the 15th day a sharp rise of fever to 103° F., high, irregular fever persisting for five days, when it fell by crisis. During this period the leucocytes rose from 8000 to 24,000 with 6 per cent eosinophiles, and there were intense persistent pains in the joints and muscles without objective change. There was no adenitis and no urticaria, or urinary changes. The pains and fever cleared critically after five days and convalescence was uneventful. No septic complication was made out.

CASE 6.—W. R. (Med. No. 36946), colored, aged 29. Admitted on the 5th day of the disease with consolidation of the right lower and middle lobes. The patient was semi-conscious and seemed desperately ill.

Date.	Hour.	Serum.	Pneumococci per c. c. of blood.	Agglutinins. 1:1	1:2	1:4	1:8
Dec. 28 5th day	2.00 p.m.	Admitted to ward.	....	....	....	....	....
	7.00 p.m.	1 c. c. subcutaneously.	900	++	0	0	0
	7.45 p.m.	100 c. c. intravenously.	....	....	....	....	....
	8.15 p.m.	.....		++++	0	0	0
	12.00 m.	.....	25	++++	0	0	0
Dec. 29 6th day	12.15 a.m.	200 c. c. intravenously.	....	....	....	....	....
	1.00 a.m.	.....	....	++++	++	0	0
	11.15 a.m.	.....	50	+	0	0	0
	11.30 a.m.	100 c. c. intravenously.	....	....	....	....	....
	12.00 noon	.....	....	++++	++++	0	0
	2.00 p.m.	Died.	....	....	....	....	....

Serum Reactions.—Within one-half hour after the first injection there was a slight chill. No apparent reaction after other injections.

The serum exercised no noticeable effect on the patient's general condition. The temperature, pulse and respirations remained high. He died in sudden collapse.

During a period of 16 hours 400 c. c. of serum were given. There was a marked reduction of the number of colonies (from 900 per c. c. to 25 per c. c.), and a definite increase in the agglutinative titer of the patient's serum.

There was no apparent spread of the pulmonary involvement.

Autopsy.—Lobar pneumonia of the right lower and middle lobes. Fibrinous pleurisy, bronchopneumonia (left lower lobe).

CASE 7.—F. S. (Med. No. 36968), white, aged 34. Admitted on the 5th day of the disease with consolidation of the right lung.

Date.	Hour.	Serum.	Pneumococci per c. c. of blood.	Agglutinins. 1:1	1:2	1:4	1:8
Dec. 27	4.00 p.m.	Admitted to ward.	..	....	....	....	....
Dec. 28 6th day	12.00 m.	1 c. c. subcutaneously.	30	0	0	0	0
	12.40 a.m.	100 c. c. intravenously.	....	....	....	....	....
	1.10 a.m.	.....	....	++	0	0	0
	11.30 a.m.	.....	2	++++	++	0	0
	11.45 a.m.	100 c. c. intravenously.	....	....	....	....	....
	12.45 p.m.	.....	....	++++	++++	++++	++++
	9.00 p.m.	.....	....	+	0	0	0
	10.30 p.m.	100 c. c. intravenously.	....	....	....	....	....
	11.30 p.m.	.....	....	++++	++	0	0
Dec. 29 7th day	11.30 a.m.	.....	1	++++	++	0	0
	12.30 p.m.	100 c. c. intravenously.	....	....	....	....	....
	2.00 p.m.	.....	....	++++	+++	+	0
	7.30 p.m.	.....	....	++++	++	0	0
	7.45 p.m.	100 c. c. intravenously.	..	....	....	....	....
	8.45 p.m.	.....	....	++++	+++	++	0
Dec. 30 8th day	10.30 a.m.	.....	0	+++	++	0	0
	11.00 a.m.	100 c. c. intravenously.	....	....	....	....	....
	12.00 noon	.....	0	++++	++++	++	0
	8.45 p.m.	.....	....	0	0	0	0
	9.00 p.m.	100 c. c. intravenously.	....	....	....	....	....
	10.00 p.m.	.....	....	0	0	0	0
Dec. 31 9th day	12.45 p.m.	.....	0	0	0	0	0
	2.00 p.m.	Died.	....	....	....	....	....

Clinical Course.—The patient was admitted on the 5th day of a very severe pneumonia with consolidation of the right lower lobe. He was suffering from alcoholism, was in collapse and seemed desperately ill. During the next three days he received 700 c. c. of serum. There was no demonstrable effect on the clinical course—he continued to be delirious and desperately ill, dying in collapse on the 8th day. The temperature and pulse remained elevated. The pneumococci promptly disappeared from the blood following the injection of the serum, and did not return, but there was a spread throughout the right lung of the consolidation.

Following the first injection of serum there was a severe chill lasting about one hour. No reaction was noted after the other injections.

Autopsy.—Lobar pneumonia (right).

CASE 8.—H. R. (Med. No. 37477), white, aged 35. Admitted on the 7th day of the disease with consolidation of right lower lobe. The patient was delirious and seemed very ill.

Date.	Hour.	Serum.	Pneumococci per c. c. of blood.	Agglutinins. 1:1	1:2	1:4	1:8
Feb. 20 7th day	10.00 a.m.	Admitted to ward.	....	....	....	....	....
	8.00 p.m.	1 c. c. subcutaneously.	20	0	0	0	0
	10.00 p.m.	75 c. c. intravenously.	....	....	....	....	....
	11.00 p.m.	.....	....	0	0	0	0
Feb. 21 8th day	1.00 p.m.	.....	0	0	0	0	0
	2.00 p.m.	50 c. c. intravenously.	....	....	....	....	....
	3.00 p.m.	.....	....	++	0	0	0
Feb. 22 9th day	3.00 p.m.	.....	0	++	0	0	0
	4.00 p.m.	50 c. c. intravenously.	....	....	....	....	....
	5.00 p.m.	.....	....	++++	++	0	0
Feb. 23 10th day	4.00 p.m.	.....	0	++++	++	0	0
	5.00 p.m.	100 c. c. intravenously.	....	....	....	....	....
	6.00 p.m.	.....	....	++++	++++	++	0

Clinical Course.—The patient was admitted on the 7th day of a severe lobar pneumonia. The right lower lobe was consolidated. The patient was suffering from alcoholism and was wildly delirious. During the first three days in the hospital 275 c. c. of serum were given. No sudden change in condition followed, lysis taking place during the 11th and 12th days. The blood-cultures became sterile after the first injection of serum, and after the third injection there was a definite increase in the agglutinative titer of the patient's serum. There was no spread of the lung involvement after the serum was given.

Serum Reactions.—The patient was restless throughout the first injection. When 70 c. c. had been given, he broke out into a sweat, which was followed in a few minutes by a profuse general urticaria. He suddenly became extremely cyanotic, there was marked asthmatic breathing, and the pulse, which had been about 120 to the minute, rose to 180. Examination of the chest showed typical asthmatic breath sounds and rales. About 10 minutes after the onset of the reaction, there was a violent chill lasting about half an hour. Following the administration of adrenalin, atropin, and morphin, the reaction gradually subsided, the rash persisting for about four hours.

The second injection of 50 c. c.—sixteen hours later—was followed in half an hour by a short period of wheezing, cyanosis and sweating. No chill and no rash.

The third injection of 50 c. c.—25 hours later—was not followed by any apparent reaction.

The fourth injection of 100 c. c.—25 hours later—was followed by a fulminating reaction exactly similar to the first one, but more severe, and lasting about four hours. The pulse at one time was over 200 to the minute, the cyanosis and dyspnœa were extreme and the patient seemed moribund.

No more serum was given, but during the next two days there was a lysis, the temperature reaching normal on the 15th day of the disease. During the following week there were occasional slight rises of temperature and slight transient urticarias. The patient became rational, and the signs in the lungs cleared. On February 28—the 15th day of the disease—he began to complain of pain in the left hip. On March 4—the 19th day—and 12 days after the first serum injection, the temperature suddenly rose to 103° F. with corresponding tachycardia, the high irregular fever continuing for a week. During this time there were intense joint pains, glandular enlargement, and crop after crop of urticarial wheals. No striking urinary changes were observed. The patient lost about 40 pounds in weight and was finally discharged well on the 50th day of the disease.

Case 9.—C. W. (Med. No. 37584), white, aged 34. Admitted on the 4th day of the disease with consolidation of the right lung. Seemed very ill—irrational and cyanotic.

Date.	Hour.	Serum.	Pneumococci per c. c. of blood.	Agglutinins. 1:1	1:2	1:4	1:8
April 2 4th day	12.00 m.	Admitted to ward.	1 in 10 c. c.	....	....	....	....
April 3	.....	.....	40	....	....	....	....
April 4 6th day	9.30 p.m.	5 c. c. intravenously.	40	0	0	0	0
	10.30 p.m.	125 c.c. intravenously.	....	....	....	....	....
	11.30 p.m.	.....	0	++++	+++	+++	++
April 5 7th day	12.30 a.m.	125 c.c. intravenously.	....	....	....	....	....
	1.30 a.m.	.....	0	++++	++++	+++	+++
	10.30 a.m.	.....	....	++++	+++	++	0
	11.30 a.m.	100 c.c. intravenously.	....	....	....	....	....
	12.30 p.m.	100 c.c. intravenously.	....	++++	++++	++++	+++
April 6 8th day	11.00 a.m.	.....	0	++++	++++	+++	++
	12.00 noon	100 c.c. intravenously.	....	....	....	....	....
	1.00 p.m.	.....	....	++++	++++	++++	++++
	11.00 p.m.	.....	....	++++	++++	++++	+++
	12.00 m.	100 c.c. intravenously.	....	....	....	....	....
April 7 9th day	1.00 a.m.	.....	0	++++	++++	++++	++++
	3.30 p.m.	.....	....	++++	++++	++++	++++
	4.30 p.m.	50 c.c. intravenously.	....	....	....	....	....
	5.30 p.m.	.....	....	++++	++++	++++	++++
April 8	.....	.....	0	....	....	....	....
9	.....	.....	0	....	....	....	....
10	.....	.....	0	....	....	....	....
11	.....	.....	2	....	....	....	....
12	.....	Optochin.	0	....	....	....	....
13	.....	Optochin.	0	....	....	....	....
16	.....	.....	0	....	....	....	....
17	.....	.....	∞	....	....	....	....

Clinical Course.—The patient was admitted on the 4th day of a very severe pneumonia with consolidation of the right lung. Owing to delay in identification of the organism, treatment was not begun until the 6th day. During the next four days 700 c. c. of serum were given. Treatment was then discontinued owing to lack of serum. During the period of treatment there was marked increase in the agglutinative titer of the patient's serum, which fell during the next two days. The pneumococci could not be grown from the blood after the first injection of serum. The temperature and pulse were apparently unaffected, and remained markedly elevated until death on the 20th day of the disease. The last dose of serum was given on the 10th day. On the 14th day two colonies per cubic centimeter were obtained, daily blood-cultures having been negative until then. On the 15th and 16th days optochin was administered and the blood again became sterile. The blood cultures were all negative until the day of death when innumerable colonies were obtained. With the terminal sepsis were associated a purulent meningitis and arthritis and an acute endocarditis. There was no spread of the pulmonary process.

Serum Reactions.—Following the first injection there was a transient urticaria. No immediate reaction followed the other treatments. From the 13th to the 19th day there were severe joint pains, and on the 19th day a profuse urticaria.

Autopsy.—Lobar pneumonia, organizing (rt.), purulent arthritis (knee-joints), purulent cerebrospinal meningitis, purulent otitis media, acute vegetative mitral endocarditis.

Case 10.—G. W. (Med. No. 37556), colored, aged 23 yrs.

Date.	Hour.	Serum.	Pneumococci per c. c. of blood.	Agglutinins. 1:1	1:2	1:4	1:8
Jan. 26	8.00 p.m.	Admitted to Ward.	....	....	....	....	....
	9.00 p.m.	.....	0	....	....	....	....
27	.....	.....	0	....	....	....	....
28	.....	.....	0	....	....	....	....
29	.....	.....	1 (Type II)	....	....	....	....
30	.....	.....	0	....	....	....	....
31	.....	.....	0	....	....	....	....
Feb. 3	.....	.....	0	....	....	....	....
4	.....	.....	0	....	....	....	....
5	.....	.....	0	....	....	....	....
6	.....	.....	1 (5 cc.) (Type I)	....	....	....	....
7	.....	.....	2 (Type I)	....	....	....	....
8	.....	.....	1 (Type I)	....	....	....	....
9	.....	.....	0	....	....	....	....
	9.30 p.m.	1 c.c. subcutaneously.	....	0	0	0	0
	10.30 p.m.	100 c.c. intravenously.	....	....	....	....	....
10	2.00 p.m.	.....	0	0	0	0	0
	2.45 p.m.	100 c.c. intravenously.	....	....	....	....	....
	3.45 p.m.	.....	....	0	0	0	0
11	11.00 a.m.	.....	0	++++	0	0	0
	11.45 a.m.	100 c.c. intravenously.	....	....	....	....	....
	12.45 p.m.	.....	....	++++	++++	0	0
12	1.00 p.m.	.....	0	++++	++++	0	0
	2.00 p.m.	100 c.c. intravenously.	....	....	....	....	....
	3.00 p.m.	.....	....	++++	++++	++++	0

Clinical Course.—The patient was admitted on the 3d day of a moderately severe pneumonia with consolidation of the right lower lobe. A Type II pneumococcus was isolated from the sputum and later from the blood. On the 7th day there was a sharp drop of the temperature and pulse almost to normal. The blood-cultures became negative, and there were signs of resolution. On the 11th day there was a sharp rise of temperature to 105° F., and the

leucocytes rose from 15,000 to 45,000. At this time signs of consolidation appeared in the left upper lobe. Three days later a Type I pneumococcus was isolated from the blood. It seemed clear that there was a fresh pneumonia due to a Type I organism. Serum therapy was begun on the 7th (?) day of this infection, 400 c. c. being given during the next three days. The temperature and pulse-rate fell, reaching normal on the 10th day. Agglutinins could be demonstrated in the patient's serum during treatment, and the daily blood-cultures were sterile. There was no further spread of the consolidation, but there was delayed resolution lasting over a period of about one month, during which a moderate continuous fever persisted.

Serum Reactions.—No immediate reaction followed any of the four injections. On the 14th day—seven days after the first injection—generalized urticaria, adenitis, and stiff neck appeared, lasting about three days. On the 21st day the patient developed a localized phlegmon of the lower abdominal wall which cleared up after incision and drainage. Further convalescence was uneventful.

CASE 11.—C. J. (Med. No. 37503), colored, aged 28. Admitted on 4th day of the disease with consolidation of the entire right lung. General condition good.

Date.	Hour.	Serum.	Pneumococci per c. c. of blood.	Agglutinins. 1:1	1:2	1:4	1:8
Jan. 27	2.00 p.m.	Admitted to ward.	....	....	....	....	....
Jan. 28	12.05 a.m.	1 c.c. subcutaneously.	0	++	0	0	0
5th day	12.30 a.m.	100 c.c. intravenously.	....	....	....	....	....
	1.30 a.m.	.....	....	+++	++	0	0
	1.00 p.m.	100 c.c. intravenously.	0	+++	++	0	0
	2.00 p.m.	.....	....	++++	+++	++	0
Jan. 29	11.30 a.m.	.....	....	++++	+++	++	0
6th day	11.45 a.m.	100 c.c. intravenously.	0	....	....	....	....
	12.45 p.m.	.....	....	++++	+++	++	++
Jan. 30	12.15 p.m.	.....	....	++++	++++	+++	++
7th day	12.30 p.m.	100 c.c. intravenously.	0	....	....	....	....
	1.30 p.m.	.....	....	++++	++++	++++	+++
	12.45 a.m.	.....	....	++++	++++	++++	++
Jan. 31	1.00 a.m.	100 c.c. intravenously.	....	....	....	....	....
8th day	2.00 a.m.	.....	....	++++	++++	++++	+++
	11.45 a.m.	.....	....	++++	++++	++++	++
	12.00 noon	100 c.c. intravenously.	0	....	....	....	....
	1.00 p.m.	.....	....	++++	++++	++++	++++
	10.00 p.m.	.....	....	++++	++++	++++	++
	10.45 p.m.	100 c.c. intravenously.	....	....	....	....	....
	11.15 p.m.	.....	....	++++	++++	++++	++++
Feb. 1	8.00 p.m.	.....	....	++++	++++	++++	++
9th day	9.00 p.m.	100 c.c. intravenously.	0	....	....	....	....
	10.00 p.m.	.....	....	++++	++++	++++	++
Feb. 2	8.00 p.m.	.....	....	++++	++++	++++	+++
10th day	8.15 p.m.	100 c.c. intravenously.	0	....	....	....	....
	9.15 p.m.	.....	....	++++	++++	++++	++++
Feb. 3*	.....	.....	0	....	....	....	....
Feb. 4	.....	.....	0	....	....	....	....
Feb. 5†	11.00 a.m.	.....	....	+++	++	0	0
13th day	12.00 noon	100 c.c. intravenously.	0	....	....	....	....
	1.00 p.m.	.....	....	+++	+++	++	++
Feb. 6	3.00 p.m.	.....	....	+++	+++	++	0
14th day	4.00 p.m.	100 c.c. intravenously.	0	....	....	....	....
	5.00 p.m.	.....	....	++	0	0	0
Feb. 7	.....	.....	0	....	....	....	....
Feb. 8	.....	.....	0	0	0	0	0
Feb. 8-21	Daily	blood culture.....	0	....	....	....	....

* Gradual fall of temperature which practically reached normal February 3.
† February 5 sharp rise of temperature to 103°.

Clinical Course.—The patient was admitted on the 4th day of a moderately severe pneumonia with consolidation of the right lung. During the following six days he received 900 c. c. of serum. There was no demonstrable effect on the clinical course, the temperature falling by lysis during the 8th, 9th, and 10th days of the disease. On February 5, the 13th day of the disease and nine days after the first injection of serum, there was a sharp rise of temperature to 103.5° F., but without evidence of spread of the pneumococcus infection. Injections of 100 c. c. of serum on February 5 and 6 were followed in about 10 minutes by a severe chill, dyspnœa and tachycardia, although there had been no reaction following any of the previous injections. The fever was unaffected and remained high for the following three weeks; it then fell gradually to normal over a period of a month. During this period the signs in the chest were those of slow resolution, and there was no further involvement (frequent X-ray control). The leucocytes ranged from 20,000 to 40,000. From February 6 to 12 there were severe abdominal pain and rigidity; from February 10 to March 12, intense continuous pains in joints, and aching and stiffness of entire body. On February 15 a marked general glandular enlargement appeared, which persisted for three weeks. The cervical glands varied in size up to 5 cm. in diameter. By March 15 the adenitis and joint pains had cleared up and the leucocytes had become normal. The temperature became normal at about this time. No urticaria or rash was seen at any time. The urine contained a small amount of albumin throughout, but no casts.

Discharged well, April 6, 1917.

DISCUSSION.

1. *The Effect of the Serum on the Presence of Pneumococci in the Blood.*—In five of the cases pneumococci were present in the blood (900, 20, 40, 30 and 2 colonies per cubic centimeter) before treatment was begun. In four of these the blood promptly became sterile after the injection of the serum, although in Case 9 there was a terminal sepsis after 14 days. In Case 6 the one injection reduced the colonies from 900 to 25 per cubic centimeter, but did not prevent death; in Case 4 the patient died without any reappearance of the organisms in the blood. In six cases no organisms were present on admission, and the blood remained sterile throughout. All these patients recovered.

The serum is, therefore, clearly an effective agent in sterilizing the blood, and in preventing the development of septicemia.

2. *The Changes in the Agglutinins in the Patient's Serum Following Treatment.*—The agglutinins were studied in eight of the cases. There was a striking variation in the titer of various patients' sera even after injection of the same amount of serum. Thus, in Case 9, agglutinins were present in considerable quantity after 125 c. c. of serum, whereas in Case 10 none could be demonstrated after 200 c. c. of serum. Furthermore, the titer of the patient's serum following therapy bore no constant relation to the outcome of the case. In Case 8, for example, the septicemia cleared up before agglutinins could be demonstrated, and the patient recovered from a very severe pneumonia with only a slight transient appearance of agglutinins in his serum. In Case 9, on the other hand, the patient, after having a high titer and sterile blood for 13 days, died with an overwhelming pneumococcus sepsis. The titer of the patient's serum is therefore no certain guide to the efficacy of treatment.

3. *The Effect of Serum-Therapy on the Clinical Course of the Disease.*—There was no striking change in the clinical course of the cases which could clearly be attributed to the serum. Crisis took place in Case 4 on the 7th day; the other cases cleared by lysis at about the normal time—between the 7th and 12th days. No striking critical falls of temperature

were observed after injections of serum, nor was there in any instance any sudden relief of symptoms. The total stay in the hospital was, however, much prolonged by the severe relapsing serum disease which occurred in most of the cases. It should be mentioned that many of the patients observed during this season presented marked elevations of temperature during convalescence with signs of slow resolution. This was so not only in Type I infections, but also in the other groups.

4. *The Serum Reactions.*—The following table summarizes the incidence of the serum reactions:

Case No.	Reaction immediately after serum.	Total serum.	Late reaction.
2	None.	300 c. c.	None.
1	None.	200 c. c.	None.
6	None.	400 c. c.	Died before incubation period had elapsed.
7	None.	700 c. c.	Died before incubation period had elapsed.
3	None.	300 c. c.	Slight.
10	None.	400 c. c.	Moderate.
4	None.	300 c. c.	Severe.
11	None.	1100 c. c.	Very severe.
9	Slight.	700 c. c.	Severe.
8	Fulminating.	275 c. c.	Severe.
5	Fulminating.	100 c. c.	Severe.

Without dwelling on the usual features of serum disease a few points of special interest may be noted. In two cases (about 20 per cent) very alarming reactions followed immediately after the initial injection, although no indication of hypersusceptibility had been furnished by the preliminary "desensitizing" dose. The patients presented the picture of acute anaphylactic shock. In Case 8 two reactions of this nature occurred following the first and fourth treatments, the second and third being uneventful. In five cases (45 per cent) there were very severe late reactions. These were featured by long periods of high fever and prostration punctuated by various symptoms of serum disease. In the case of C. J., Case 11, who received 1100 c. c. of serum, a marked reaction persisted without intermission for 37 days, in Case 4 for 20 days, and in Case 8 for about 14 days.

5. *Complications.*—Apart from the serum reactions, no complications occurred in any of the cases except in Case 10. This patient developed an abscess of the abdominal wall. Resolution was delayed in Cases 1, 10 and 11.

6. *The Curative Value of the Serum.*—The present series throws little light on the curative value of the serum. Most of the patients were treated after the 5th day, so that abortive terminations of the disease, suggestive of effective therapy, could not be obtained. Furthermore, two of the three fatal cases were practically moribund when the serum was given. A case such as No. 8, however, clearly seems to have been saved by serum therapy. This patient was admitted on the 7th day with 20 colonies per cubic centimeter of blood and recovered promptly after treatment. In one case only, No. 7, did the pneumonic lesion spread after the serum had been administered.

A STUDY OF THE INCIDENCE OF THE TYPES OF PNEUMOCOCCI ISOLATED FROM ACUTE LOBAR PNEUMONIA AND OTHER INFECTIONS, AND AN ANALYSIS OF THE CASES CLASSIFIED BY TYPES IN REGARD TO MORTALITY, COMPLICATIONS, ASSOCIATED DISEASES, BACTERIEMIA, AND LEUCOCYTOSIS.

By Mildred C. Clough, M. D.

(From The Medical Clinic of The Johns Hopkins Hospital.)

Beginning with February, 1915, an attempt was made to determine the group of pneumococcus concerned in all cases of lobar pneumonia in adults occurring in the wards of the Johns Hopkins Hospital according to the classification of Dochez and Gillespie.[1] Through the kindness of Dr. Howland, of the Department of Pediatrics, 13 cases of lobar pneumonia and 14 cases of empyema in children were studied. In addition, pneumococci from cases of bronchopneumonia, chronic and acute bronchitis, meningitis, peritonitis, and infection in ears and sinuses were included in the work. I have studied the incidence of the different types of pneumococci isolated between February, 1915, and September, 1916, in these conditions, and have analyzed in detail the acute lobar pneumonias in adults, classified according to the group of pneumococcus concerned, as regards age, mortality, complications, bacteriemia and sepsis, leucocytosis, and the presence or absence of associated diseases.

The organisms were isolated by blood culture, cultures from washed sputa, mouse inoculations with sputum, and, in a number of cases, from material obtained by lung puncture. In many of the cases several methods were used and the results compared. Pneumococci isolated by blood culture in cases with clinical lobar pneumonia were considered to be the type causing the pneumonia. In most cases cultures obtained by lung puncture were pure, though in one case pneumococci were associated with large numbers of influenza bacilli. Cultures from the lung direct at autopsy in this case showed influenza bacilli only, the pneumococci presumably having died out.

Pneumococci isolated from washed sputum cultured on blood agar plates, when obtained in pure culture, corresponded in all the 10 cases tested to the strains obtained by lung puncture or blood culture. In five cases cultures from the washed sputum showed pneumococci and influenza bacilli together in pure culture. In three of these cases material from lung punctures was obtained, and pneumococci alone were grown in pure culture from it. In these three cases the influenza bacilli doubtless came from the smaller bronchi, but were evidently not concerned in the disease process in the lung.

Pneumococci of Groups III and IV "fished" from sputum cultures that were not pure were not considered, without other evidence, necessarily to have any etiological relationship to the pneumonia. Several such strains acted like saprophytic mouth organisms, in that they were markedly phagocytable even in heated normal serum. In one case a Group IV pneumococcus was isolated from the sputum, while the patient's serum caused agglutination and phagocytosis of Group II pneumococci so markedly as to leave no doubt but that the case was a pneumonia due to a Group II strain.[3] In one case of lobar pneumonia strains belonging to both Groups III and IV were isolated from the same sputum culture. In one case of bronchopneumonia pneumococci belonging to an Atypical Group II and Group III occurred in the same sputum culture. In another case of lobar pneumonia, a Group IV was isolated from the sputum and an Atypical II from the blood.

When the sputum was easily washed, cultures were preferred to mouse inoculations for several reasons. By culture the presence of *Bacillus influenzæ* as the cause of an empyema (not included in this study) was demonstrated in one case, and *B. influenzæ* associated with a Type IV pneumococcus in another case. The association of *Bacillus influenzæ* with an Atypical Type II pneumococcus in the lung of a case of lobar pneumonia has already been mentioned. The influenza bacilli would not have been demonstrated in these cases by mouse inoculation. In the two cases mentioned before, in which a Group IV and an Atypical II pneumococcus were each associated with a Group III in the sputum culture, mouse inoculation would probably have resulted in a sepsis with the mucosus strain. In these cases the Group III was probably a mouth organism, and the Group IV the cause of the pneumonia, since both cases recovered after a very mild course. With the relatively avirulent Type IV and Atypical II strains, mouse inoculation was especially unsatisfactory. Often mice did not die even after the injection of relatively large amounts of sputum intraperitoneally, or they died with sepsis from some other organism. Material from lung punctures contained so few pneumococci, that it was insufficient to kill mice when injected intraperitoneally, even in the case of the more virulent strains.

Group determinations were made by testing the agglutinability of the organisms with sera I and II obtained from the Rockefeller Institute through the kindness of Dr. Cole. Group III strains were identified by their morphological and cultural characteristics. Organisms agglutinating slowly with Group II serum, and only in the more concentrated dilutions, 1-32 or under, at the end of 24 hours, were considered Atypical II strains. Several organisms agglutinating atypically with serum I, and several agglutinating with both sera are included under the heading miscellaneous. These are at present being studied in detail. Of the Atypical II strains, four (all from lobar pneumonias) belonged to Avery's Subgroup IIA, and five (three of which were from pneumonias, one from a maxillary sinusitis, and one from a meningitis) belonged to Subgroup IIB.[3] The other strains were not classified in this way.

In all, 121 strains of pneumococci were isolated and the groups determined. Table 1 shows the incidence of the different groups in numbers and percentages in the various conditions studied.

TABLE 1.

Incidence of the Types of Pneumococci in the Various Diseases Studied.

	Total No.	Type I		Type II		Type III		Type IV		Type Atypical II		Misc.	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Lobar pneumonia—adults	54	19	35.2	3	5.5	8	14.8	14	25.9	9	16.7	1	1.9
Lobar pneumonia—children	13	4	30.8	1	7.7	0	0	4	30.8	3	23.1	1	7.7
Empyema—adults	6	2	33.3	0	0	1	16.7	2	33.3	1	16.7	0	0
Empyema—children	14	7	50	2	14.3	0	0	3	21.4	2	14.3	0	0
Bronchopneumonia	10	1	10	0	0	2	20	3	30	2	20	2	20
Chronic bronchitis	5	0	0	0	0	0	0	3	60	0	0	2	40
Acute bronchitis	2	0	0	0	0	0	0	1	50	1	50	0	0
Sinusitis, otitis media, etc.	13	1	7.7	0	0	2	15.4	8	61.5	2	15.4	0	0
Meningitis	3	0	0	0	0	0	0	1	33.3	2	66.6	0	0
Peritonitis	1	0	0	0	0	0	0	0	0	0	0	1	100
	121	34		6		13		39		22		7	

The following points are brought out in this table:

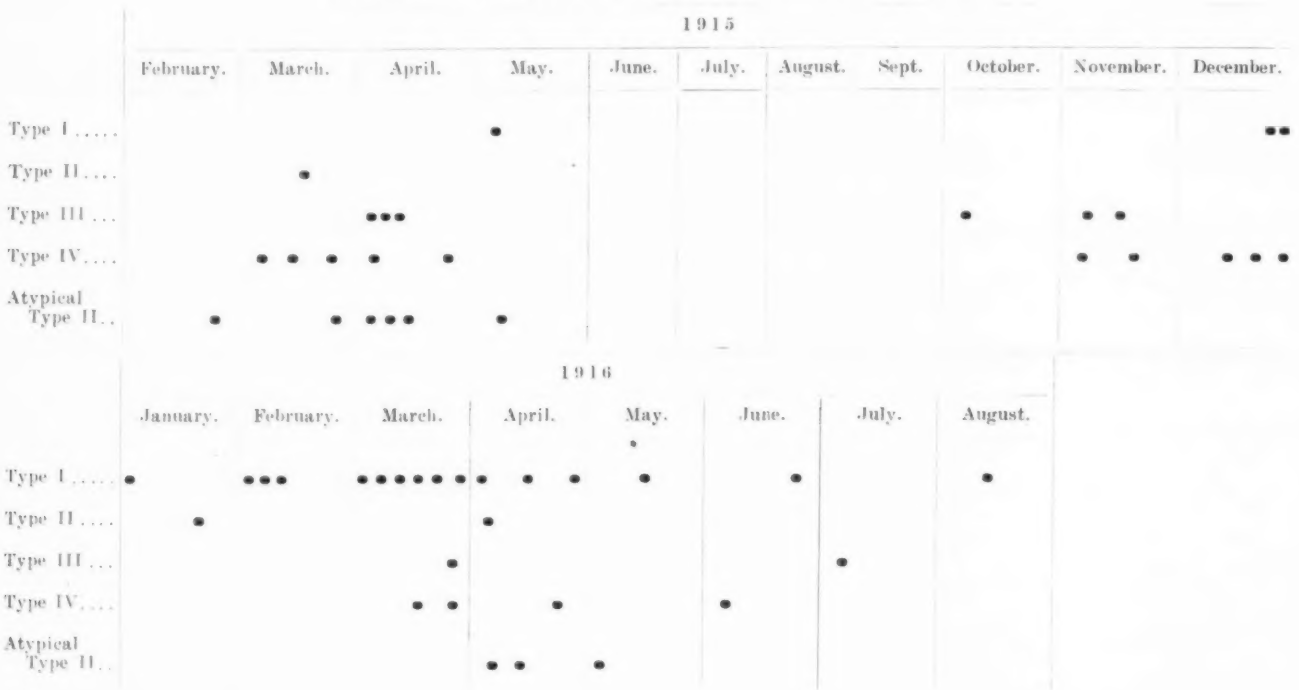
1. The percentage incidence of Groups I, III, and IV in the lobar pneumonias in adults corresponds very closely to figures obtained at the Rockefeller Institute in their pneumonias from 1912-1916 (Group I, 33.54 per cent; Group III, 11.18 per cent; Group IV, 23.64 per cent);[4] and approximately to those obtained by Mathers[6] in Chicago, by Walker[6] in Boston, by Richardson[7] and by Lewis[8] in Philadelphia. The striking feature in this series is the relatively very low percentage of typical Group II pneumococci, and the correspondingly high percentage of Atypical Group II strains. Of these latter strains, three were classified by Avery[5] as belonging to Subgroup IIA, and another was identified as a Subgroup IIA by means of serum sent from the Rockefeller Institute. Two other strains studied by Dr. Paul W. Clough[2] by means of phagocytic tests showed the reactions of Atypical Group II organisms. The remaining three strains were agglutinated by serum II at the end of 24 hours in dilutions of 1-4, 1-8, and 1-8, respectively, the controls in normal horse serum being negative. In the statistics hitherto published, Atypical Group II organisms have not been differentiated from typical Group II strains, except in the series for the year 1915-1916, reported by Stillman[4] from the Rockefeller Hospital. Of 102 strains included in his report, Subgroup IIA occurred five times and IIX once, a total of about 6 per cent. This differentiation is probably important, since members of these subgroups usually have a relatively low virulence for animals, and since they have been isolated from the mouths of normal individuals.[3,4] It is probable, therefore, that they will be shown epidemiologically to resemble Type IV rather than Types I and II.

2. The small series of lobar pneumonias in children showed a slightly lower incidence of Groups I and III, with a correspondingly higher incidence of Groups IV and Atypical II as

compared with the lobar pneumonias of adults. If, however, the empyemas in children are added to the pneumonias and the percentage of these sums calculated, the incidence of Groups I and II becomes slightly higher than in the pneumonias in adults. These figures do not correspond to those given by Pisek and Pease,[9] Wollstein and Benson,[10] and Mitchell,[11] who have found a higher percentage of pneumonias due to Group IV in children than in adults. This discrepancy may be explained in two ways. In the first place, only lung puncture material was used for the cultures in this series, while most of the cultures obtained by the other authors were from sputum. In this study Group IV pneumococci have several times been isolated from the sputum in pneumonias due to the fixed types, and Wollstein and Benson[10] and others report similar experiences. The isolation of a Group IV pneumococcus from a mixed culture of sputum, or even by mouse inoculation with sputum, cannot, therefore, be considered as undoubted evidence that the pneumonia is due to a Group IV organism. In the second place, all the cases in the series were lobar pneumonias, while the authors mentioned included bronchopneumonias with lobar pneumonias in their statistics. Pisek and Pease[9] studied 48 cases of pneumonia of both types and found 22.9 per cent due to Group I, 29.3 per cent due to Group II, 8.3 per cent due to Group III, and 39.8 per cent due to Group IV. Only 28 of these cases were lobar pneumonias, and of them nine were due to Group I, eleven to Group II, one to Group III, and seven to Group IV. If one calculates the percentage incidence of the different groups in their lobar pneumonias only (excluding bronchopneumonias), the percentages obtained (Type I, 32 per cent; Type II, 39 per cent; Type III, 3 per cent; Type IV, 25 per cent) correspond very closely to those reported from the Rockefeller Hospital in their series of 313 cases of lobar pneumonia in adults from 1912-1916. (Type I, 33.5 per cent; Type II, 31.6 per cent; Type III, 11.1 per cent; Type IV, 23.6 per cent.[4]) Wollstein and Benson studied 11 cases of lobar pneumonia and 36 cases of bronchopneumonia. In their cases, also, the percentage incidence of the different types in the lobar pneumonias, if separated from the bronchopneumonias, is not very different from the figures in adults. In all these reports the percentage of the bronchopneumonias in children due to Groups I and II is relatively very low. This was also the case in our study of the bronchopneumonias in adults, as is shown in Table I. It seems probable, therefore, that the incidence of the different types in children is approximately the same as in adults.

TABLE 2.

CHRONOLOGICAL INCIDENCE OF LOBAR PNEUMONIA IN ADULTS BY TYPE.



Of the Atypical Group II pneumococci isolated from lobar pneumonias in children and from empyemas, three out of the six belonged to Subgroup IIB. This is of some interest, because Stillman[4] reports that of the six cases of pneumonia due to Atypical Group II at the Rockefeller Hospital, none was due to Subgroup IIB.

3. A Group I pneumococcus was isolated from one out of 10 cases of bronchopneumonia. The other cases were due to Types III, IV and Atypical II in about equal percentages. It is of interest that one of the Group III bronchopneumonias

died six months later from a Group III lobar pneumonia. Pneumococci from cases of acute and chronic bronchitis belonged in every case to either Group IV or Atypical Group II with the exception of two atypical pneumococci classified under miscellaneous.

4. An interesting case in which a Group I was isolated from an otitis media and from mouth sputum gave a history of a mild pneumonia following "grippe" nine months previously, and presumbably had been a carrier throughout this period.

5. The meningitis cases studied belonged to the relatively avirulent Groups IV and Atypical II, one of the Atypical Type II strains belonging to Subgroup IIB.

Table 2 shows graphically the incidence of the different types in lobar pneumonia in adults by months from February, 1915, to August, 1916.

The almost total absence of pneumonias due to Group I during the year 1915 shown in Table 2 is striking, while in the spring of 1916 an epidemic of Group I pneumonias occurred. In April, 1915, three cases due to Group III were admitted to the hospital within three days, and in October and November there was another series of three cases. Except for the summer months, the Group IV cases seemed to be more evenly distributed throughout the year than were the fixed types. These facts, if borne out in a larger series, would support the view that Group IV infections may be autogenous, in contradistinction to the probably epidemic nature of pneumonias due to the fixed types.

Table 3 shows the incidence and mortality of the pneumonias in adults due to the different groups of pneumococci, with the average age of the cases; the percentage of cases with and without associated diseases; and the percentage mortality of the cases subdivided in this way.

TABLE 3.

The Relation of the Type of Pneumococcus in Lobar Pneumonia in Adults to Mortality, Complications, Age, and Associated Diseases.

Types.	Incidence.		Mortality.		Complications.		Average Age.	Cases with associated diseases.				Cases without associated diseases.			
								Incidence.		Mortality.		Incidence.		Mortality.	
	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%	No.	%
I	19	35.2	7	36.8	6	31.6	32.5	5	26.3	3	60	14	73.7	4	28.5
II	3	5.5	0	0	1	33	27.6	1	33.3	0	0	2	66.6	0	0
III	8	14.8	8	100	4	50	45.3	2	25	2	100	6	75	6	100
IV	14	25.9	8	57.2	5	35.7	46.5	10	71.4	7	70	4	28.6	1	25
Atypical II	9	16.6	4	44.4	2	22	40.2	5	55.5	3	60	4	44.5	1	25
Misc.	1	2	0	0	0	0	53	0	0	0	0	1	100	0	0
Total	54	100	27	50	18	33.3		23	42.6	15	65.2	31	57.4	12	38.7

As shown in the table, the total mortality of the series was high (50 per cent). All of the eight cases due to the pneumococcus mucosus died. The mortality of the Group IV cases was relatively very high (57.2 per cent), and much higher than that given by Cole[12] for the Group IV pneumonias at the Rockefeller Hospital (16 per cent) and by Mathers[5] in Chicago (25 per cent). The explanation for these results in our series is probably the greater average age of the cases of this group (46.5 years), and the very high percentage of associated diseases in these cases (71.4 per cent), as compared with 26.3 per cent, 33.3 per cent, and 25 per cent in the fixed types. Marked alcoholism is included as an associated disease on account of the large part which it seems to play in the incidence and mortality of pneumonia. The same explanation is offered for the mortality of the pneumonias due to Atypical II strains, which is higher than one would expect with organisms which are usually relatively avirulent. Several terminal pneumonias and one post-operative pneumonia were included in this study, all of which were due to Type IV or Atypical II organisms.

The following is an enumeration of the associated diseases occurring in the pneumonias due to the different types:

GROUP I.

14 cases—none.
2 " alcoholism and latent syphilis (Wass. R. +). 41 and 38 years.
1 " latent syphilis (Wass. R. +), emphysema. 50 years.
1 " alcoholism. 23 years.
1 " chronic endocarditis. 30 years.

GROUP II.

2 cases—none.
1 " alcoholism. 30 years.

GROUP III.

6 cases—none.
1 " lymphatic leukemia. 30 years.
1 " syphilitic cirrhosis of liver. 62 years.

GROUP IV.

4 cases—none.
2 " alcoholism. 36 and 58 years.
1 " pulmonary tuberculosis, cystitis, hydronephrosis (?). 52 years.
1 " prostatic abscess, syphilitic periostitis, chronic pancreatitis. 55 years.
1 " alcoholism and latent syphilis (Wass. R. +). 45 years.
1 " alcoholism, cirrhosis of liver, syphilitic aortitis, arteriosclerosis. 49 years.
1 " chronic tuberculosis. 60 years.
1 " alcoholism, carcinoma of stomach with perforation and peritonitis, latent syphilis (Wass. R. +), chronic tuberculosis, arteriosclerosis. 57 years.
1 " alcoholism, hypertension, hemiplegia, mitral insufficiency, acute bacterial endocarditis (?). 61 years.
1 " pulmonary tuberculosis. 40 years.

ATYPICAL GROUP II.

3 cases—none.
1 " pregnancy. 28 years.
1 " post-operative (operation for prostatic hypertrophy). 65 years.
1 " alcoholism, chronic tuberculosis, bronchiectasis, chronic nephritis, chronic fibrous pleurisy and peritonitis, syphilitic aortitis. 43 years.
1 case alcoholism, tuberculosis. 17 years.
1 " alcoholism, diabetes with coma, arteriosclerosis, emphysema. 41 years.
1 " syphilis (Wass. R. +), emphysema, aneurism (?), syphilis of aorta (?), lung tumor (?). 58 years.

Group IV and Atypical II pneumococci, then, seem to be the most frequent cause of lobar pneumonia in old people, in those with chronic diseases, in terminal pneumonias, and in pneumonias occurring in alcoholics; and the high mortality of these two groups in our series is probably dependent upon the associated conditions. In all the types the mortality was much higher in those cases with associated diseases than in those without.

The complications aside from sepsis were more frequent in the pneumonias due to the fixed types, especially Type III, than in those due to Atypical II and IV types, while sepsis was a much more frequent complication in the latter two types, as is shown in the next table. The complications, excluding sepsis, met with in each group are as follows:

GROUP I.

13 cases—none.
3 " delayed resolution.
1 " otitis media.
1 " peritonitis.
1 " pneumothorax following pleural aspiration.

GROUP II.

2 cases—none.
1 " pleural effusion (not purulent).

GROUP III.

4 cases—none.
1 " empyema.
1 " pericarditis.
1 " empyema and pericarditis.
1 " acute bacterial endocarditis.

GROUP IV.

10 cases—none.
1 " pericarditis.
1 " empyema.
1 " acute bacterial endocarditis.
1 " thrombosis.

ATYPICAL GROUP II.

7 cases—none.
2 " pericarditis.

Tables 4 and 5 show the percentage of positive blood cultures obtained in the lobar pneumonias in adults divided according to the types of pneumococci concerned, and the relation of the positive cultures to mortality.

TABLE 4.

INCIDENCE OF BACTERIEMIA, AND ITS RELATION TO MORTALITY IN LOBAR PNEUMONIAS OF EACH TYPE.

Types.	Number Cultured.	Cases with negative cultures.				Cases with positive cultures.			
		Incidence.		Mortality.		Incidence.		Mortality.	
		No.	%	No.	%	No.	%	No.	%
I	17	13	76.5	3	23.1	4	23.5	4	100
II	3	3	100	0	0	0	0	0	0
III	3	2	66.6	2	100	1	33.3	1	100
IV	11	6	54.5	2	33.3	5	45.5	4	80
Atypical II	5	2	40	0	0	3	60	2	66
Total	39	26	66.6	7	26.9	13	33.3	11	84.6

TABLE 5.

RELATIONSHIP OF BACTERIEMIA TO MORTALITY.

	Incidence.	Cases with negative blood cultures.		Cases with positive blood cultures.	
	No.	No.	%	No.	%
Cultured cases which died	18	7	38.9	11	61.1
Cultured cases which recovered	21	19	90.5	2*	9.5

* Both cases had only one colony per c.c. of blood.

The percentage of positive cultures in the whole series was somewhat lower (33.3 per cent) than that obtained by Dochez,[13] Rosenow,[14] Strouse and Clough,[15] Mathers,[5] and others. This was due in part to the fact that a blood culture was taken on admission to the hospital, and was usually not repeated unless some special indication for it arose. A relatively high percentage of positive cultures was obtained in the pneumonias due to Group IV and Atypical II (all Subgroup IIA). One of the cultures from a Group IV pneumonia contained many thousand colonies per cubic centimeter of blood, and one from a Subgroup IIA case 2000 colonies per cubic centimeter. The more virulent Group I strains caused a bacteriemia in only half as many cases. In one of these cases there were 200 colonies per cubic centimeter, and in the remaining cases five colonies or less per cubic centimeter of blood. All the meningitis cases studied belonged to Groups IV or Atypical II, and Wollstein [16] reports two cases both due to a Group IV pneumococcus. These findings suggest that the avirulent strains are more likely to enter and multiply in the circulation than are the fixed types. This may be due in part to the fact that most of the patients in this group were elderly individuals with associated diseases, and hence might have a lowered resistance to a general infection. However, the series is too small to warrant any definite conclusions on this point.

The mortality of the cases with bacteriemia is much higher than that of the cases with negative blood cultures, 84.6 per cent of the cases with positive blood cultures dying, as against 26.9 per cent of those with negative blood cultures. The relationship is shown in a different way in Table 5, in which all the cases cultured are divided according to whether they died or recovered. Of those which died, 61.1 per cent had bacteriemia, while of those which recovered, only 9.5 per cent (two cases) had pneumococci in the blood, and each of these cases had only one colony per cubic centimeter.

White blood counts were made on all the cases, and the average counts in the different groups of adult pneumonias compared. The counts were also averaged in cases with positive and in those with negative blood cultures, and in cases which died and in those which recovered, and the results entered in Table 6 for comparison.

The most striking feature in this table is the relatively low leucocyte count in the Group III cases (11,800). The highest count obtained is used for the averages, which, in the Group III cases, was usually on admission, the count in most of these cases falling with the progress of the disease. The average counts for the other groups are very close, 23,000 to 27,000,

TABLE 6.

LEUCOCYTOSIS IN THE LOBAR PNEUMONIAS OF EACH TYPE AND ITS RELATIONSHIP TO BACTERIEMIA AND MORTALITY.

Types.	Average Leucocyte Count.				
	All cases.	Cases with positive blood cultures.	Cases with negative blood cultures.	Cases which died.	Cases which recovered.
I	24,100	25,200	22,400	24,500	22,200
II	27,300	.....	27,300	.....	27,300
III	11,800	8,000	10,500	11,800	.....
IV	24,600	20,200	31,500	17,700	32,600
Atypical II....	22,800	17,300	18,500	19,200	25,600

though in the cases due to Groups IV and Atypical II there were more instances of a hyperleucocytosis of over 40,000.

The leucocyte count was higher in the cases due to Groups IV and Atypical II which recovered than in those which died, and higher in the cases of Group IV with negative blood cultures than in those with positive blood cultures. As regards the cases due to Group I, the average counts were practically the same in those cases with negative and with positive blood cultures, as well as in those recovering and those dying.

SUMMARY.

In this study the grouping of 121 strains of pneumococci from different diseases was determined, and the percentage incidence of the different groups in the various conditions calculated. The lobar pneumonias in adults were analyzed in detail in regard to the mortality, age, presence or absence of associated diseases, complications, bacteriemia, and leucocytosis. No definite conclusions can be drawn from so small a series, but certain points were brought out which would be significant if confirmed by a large series.

In isolating the pneumococci, lung puncture cultures, blood cultures, sputum cultures, and mouse inoculations with sputum were used. Sputum cultures were preferable to mouse inoculations when a specimen of sputum which could be thoroughly washed was obtainable.

The percentage incidence of the different types of pneumococci in acute lobar pneumonia in adults corresponded very closely to that reported elsewhere, except for the low percentage of Group II and the correspondingly high percentage of Atypical Group II strains.

The percentage incidence of the types in lobar pneumonias in children, excluding bronchopneumonias, was approximately the same as in adults.

In three cases, two of which were lobar pneumonias in children and one an empyema in an adult, Atypical Type II pneumococci belonging to Subgroup IIB were isolated.

Of the bronchopneumonias, only one was due to Type I, and none to Type II. Types III, IV, and Atypical II occurred in about equal percentages. In the cases of acute and chronic bronchitis, otitis media, and sinusitis, but one pneumococcus belonging to Type I was isolated. This was a strain grown from the pus of an otitis media and from the mouth sputum of a patient who had probably been a carrier for nine months.

Pneumonias due to Groups I and III occurred in epidemics, whereas those due to Group IV were more uniformly distributed throughout the year.

The total mortality of the pneumonias in adults was high (50 per cent). The mortality among the Group IV cases was very high (57.2 per cent), due in part to the greater age of the patients and the high percentage of associated diseases, including alcoholism, which occurred in this group. In all of the groups the mortality was higher in cases with associated diseases than in those without.

Complications, apart from sepsis, were more frequent in the pneumonias due to the fixed types.

Blood cultures were positive in 33.3 per cent of all cases cultured. The percentage of positive cultures and the number of colonies per cubic centimeter of blood were higher in the cases due to Group IV and Atypical II than in those due to the fixed types. In all the types the mortality was very high in the cases with bacteriemia, and low in those without bacteriemia.

The white blood cell count was low in pneumonias due to the pneumococcus mucosus, and usually fell as the disease progressed. In the cases due to Group IV and Atypical II strains, the count was higher in those recovering than in those dying; and in the Group IV cases, higher in those without bacteriemia than in those with bacteriemia. In the Group I pneumonias the counts averaged about the same in the cases which recovered as in those which died.

REFERENCES.

1. Dochez, A. R., and Gillespie, L. J.: A biologic classification of pneumococci by means of immunity reactions. J. Am. M. Ass., 1913, LXI, 727-730.

2. Clough, P. W.: Personal communication.

3. Avery, O. T.: A further study on the biologic classification of pneumococci. J. Exper. M., 1915, XXII, 804-819.

4. Stillman, E. G.: A contribution to the epidemiology of lobar pneumonia. J. Exper. M., 1916, XXIV, 651-670.

5. Mathers, G.: The varieties of pneumococci causing lobar pneumonia with especial reference to their biologic differences. J. Infec. Dis., 1915, XVII, 514-521.

6. Walker: Quoted by Mitchell, A. G., 11.

7. Richardson: Quoted by Mitchell, A. G., 11.

8. Lewis: Quoted by Cole, R. I. Pneumococcus infection and immunity. N. York M. J. (etc.), 1915, CI, 1-7.

9. Pisek, G. R., and Pease, M. C.: A preliminary report on pneumonia in children with special reference to its epidemiology. Am. J. M. Sc., 1916, CLI, 14.

10. Wollstein, M., and Benson, A. W.: Types of pneumococcus found in the pneumonias of infants and young children. Am. J. Dis. Child., 1916, XII, 254-265.

11. Mitchell, A. G.: The types of pneumococci in infants and children. Penn. M. J., 1916-17, XX, 343-345.

12. Cole, R. I.: The specific treatment of acute lobar pneumonia. *Ibid.*, 345-351.

13. Dochez, A. R.: Occurrence and virulence of pneumococci in the circulating blood during lobar pneumonia. J. Exper. M., 1912, XVI, 680-692.

14. Rosenow, E. C.: Studies in pneumonia and pneumococcus infections. J. Infect. Dis., 1904, I, 280-312.

The blood in lobar pneumonia, J. Am. M. Ass., 1905, XLIV, 871.

15. Strouse, S., and Clough, P. W.: Blood cultures in pneumonia. Bull. Johns Hopkins Hosp., 1910, XXI, 247-251.

AN EPIDEMIOLOGICAL STUDY OF LOBAR PNEUMONIA.

By Virgil P. W. Sydenstricker and Alan C. Sutton.

(From the Medical Clinic of The Johns Hopkins Hospital, Baltimore.)

During the past 10 months 66 cases of pneumonia have been treated in the medical service of the Johns Hopkins Hospital. Relatively few of the patients entered the hospital as early as the first or second day. The average admission was between the fourth and fifth day. A few were not seen until the tenth day or even later. We were able to determine the type of pneumococcus concerned in 97 per cent of the cases. The organism was isolated by either blood or sputum cultures. Lung puncture was never resorted to.

The identification of the strains of pneumococci was carried out along the lines in use at the hospital of the Rockefeller Institute.[1,2] All sera used either for agglutination tests or treatment were given to us by that institute.

The distribution of the cases among the various types is given in Table 1. Twenty-four cases are included in Type I. Some of these patients received serum treatment; others did not. The entire subject of the serum treatment of these cases is dealt with fully in Bloomfield's paper. No cases due to Type III, *Pneumococcus mucosus*, occurred in the series. A large percentage of our cases were in negroes, 52 in contrast to 14 in whites.

The mortality rates for the entire season are given in Table 2. The table shows the rates for each group as a whole, and subdivided between blacks and whites. It also contains the rates for the season regardless of group distribution. Percentages computed from such a small group of cases as this are of little real value and at times misleading. They are given here in order to facilitate their use in the compilation of a similar but much larger group, several years from now. Of the 20 patients that died, five succumbed in less than 24 hours after reaching the hospital. All of these had a severe septicæmia, except one who died immediately on reaching the hospital, before any cultures could be obtained. Two died after being in the hospital 15 days. The rest lived from two to six days, averaging three and a half days in the hospital.

Complications were encountered in six cases. All were associated with a severe septicæmia. Pneumococci were recovered from the local foci in all instances. The distribution was:

Meningitis	4 cases.
Purulent arthritis	3 cases.
Pericarditis	1 case.
Otitis media	1 case.

Almost half of our cases of pneumonia came from Sparrows Point, Maryland. During November and up to the middle of December the cases from there were without exception Type I infections. We feared they might be the forerunners of a Type I epidemic. This, together with the fact that the incidence of severe pneumonias during the winter months is always very high there, led us to undertake the following epidemiological studies. We hoped to throw some light on the presence of healthy carriers in this community, and to see whether the proportion of the various strains carried in the mouths of the healthy men was different from that known to exist elsewhere.[3,4] The carrying out of this work was made possible by the courtesy and coöperation of the officials of the Bethlehem Steel Company, and of Drs. Carmine and Merriam in the company's employ.

Sparrows Point is the home of the Maryland Division of the Bethlehem Steel Company. It is situated on the waterfront near the mouth of the Patapsco River, about 10 miles below Baltimore. The plant employs about 7000 men. Some have homes in Baltimore, but the majority live in the town which has grown up around the plant. About 2000 of the men are negroes. Half of these live in the company's shanties, in a section of the works called "Coke Oven Row." This group of shanties is shown in Fig. 1, which is reproduced from the company's map with their consent. The shanties are built 10 in a row. Each accommodates four men. The shanty is a small room 14 feet square, with four bunks, four lockers, a washstand and a stove. One building is used as a store, barber-shop and pool-room. This is a common meeting-place and usually crowded. Most of the men get their own meals, but there is a cook-shop which some of the men use.

Formerly all the shanties were frame buildings, the wall being a single thickness of board. Recently a group of 100 tile and concrete shanties has been added. The shanty group is situated directly on the shore, and is consequently exposed to all sorts of weather. The majority of our pneumonia cases came from this Coke Oven group. The view commonly held among the company's physicians is that pneumonia has always had a high incidence and been of a severe form among these men in the shanties.

The group seems to offer excellent opportunities for epidemiological studies. It is an isolated group of 1000 men living under almost identical conditions. They are in intimate contact with each other and with no one else. They crowd into the store or into each other's shanties. They frequently close the two small windows and door, and, in addition, try to pack the cracks between the boards with newspaper, especially in winter, to keep out the cold. They sleep sometimes with the stove lit, or, if too tired to start a fire, they sleep without it, often with too few blankets. Thus these men are exposed to

[1] Dochez, A. R., and Gillespie, L. J.: J. A. M. A., 1913, LXI, 727.

[2] Dochez, A. R., and Avery, O. T.: Jour. Exp. Med., 1915, XXI, 114.

[3] Dochez, A. R., and Avery, O. T.: Jour. Exp. Med., 1915, XXII, 105.

[4] Stillman, E. G.: Jour. Exp. Med., 1916, XXIV, 651.

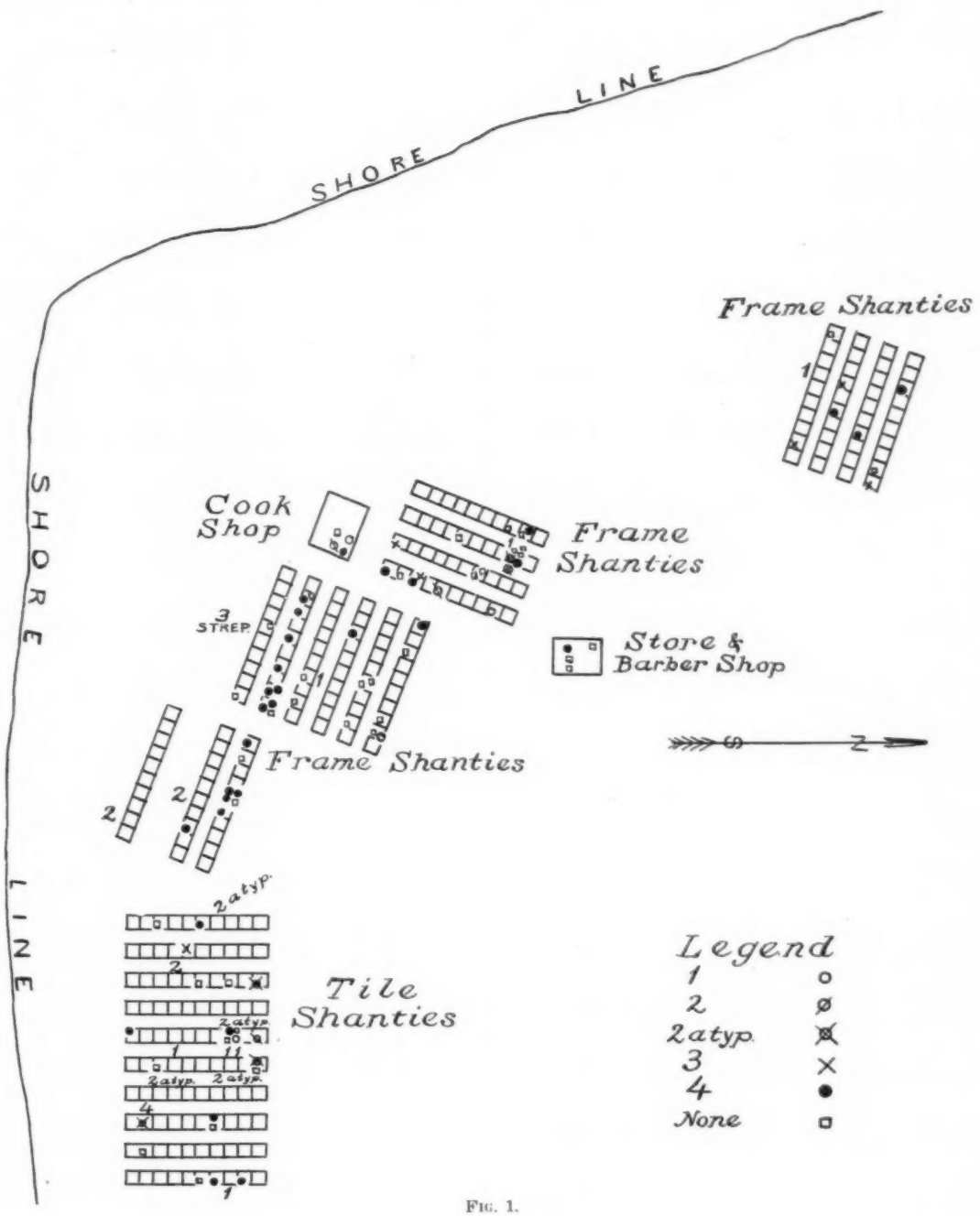

SHORE LINE
SHORE LINE
Frame Shanties
Cook Shop
Frame Shanties
3 STREP.
Store & Barber Shop
Frame Shanties
2 atyp.
Tile Shanties
Legend
1
2
2 atyp.
3
4
None

Fig. 1.

sudden changes of temperature. Few of them, however, are exposed to the heat of the furnaces, since practically all are employed on outside work. Another factor, which may play a rôle in their susceptibility, is that most of them come from the south and are not used to winters as severe as in this climate.

It is this group, then, that we undertook to study. We collected, during the latter part of January, specimens of sputum from 100 of these men. In Fig. 1 the types are spotted on their respective shanties. The figures by the shanties give the types of the cases of pneumonia from each shanty which were treated in the hospital.

Of the four men employed in the cook-shop, one carried a Type I, one a Type II, the other a Type IV, and one was free from pneumococci.

The sputa were collected in sterile bottles, brought immediately to the laboratory and white mice then inoculated with 0.5 c. c. of sputum subcutaneously. The mice were allowed to die and cultures made from the peritoneum and from the heart's blood. The pneumococci were usually obtained in pure culture.

In order to have a normal group with which to compare them, we cultured in a similar way 50 sputa collected at random among our dispensary patients. The results of these studies are tabulated in Table 3. The striking difference is in the high incidence of the fixed types in the Coke Oven group—the number of Type IV pneumococci is practically the same, the difference being in the small number of negative cultures in the Sparrows Point group. The high incidence of fixed types among the mouth organisms parallels the high percentage of fixed-type pneumonias and the extremely low percentage of cases due to the Type IV pneumococcus among Coke Oven Row cases, as contrasted with our city cases of pneumonia in Table 4. Another point is a pneumonia morbidity rate at Coke Oven Row of approximately 6 per cent, which is very high in comparison with the Health Department rate for Baltimore City of less than 0.5 per cent. The latter is an estimate based on the Health Department mortality rate. The mortality of the Sparrows Point group is shown in Table 5. It varies little from the rates given for the entire group.

Several interesting features warrant special mention. In Shanty 609 we collected sputa from six men. Two contained Atypical Type II pneumococci, one a Type IV, and three yielded no pneumococci. One of the last group later developed a Type I pneumonia. In Shanty 43 all four men developed pneumonia the same day, following a sudden fall in temperature. One was treated in another hospital in this city. The type of pneumococcus was not determined in this case. One refused hospital care and went to his home in the south. The other two came here. They had Type I and Atypical Type II infections, respectively. They stayed together in a side room by themselves the entire time. The one that was recovering from the Atypical Type II infection suddenly relapsed after his temperature had become normal. A lobe, in the opposite lung from the one previously involved, became consolidated. His blood cultures again became positive. This time a Type I pneumococcus was isolated. Prior to the isolation of the Type I organism, the development in the patient's serum of antibodies active toward the Atypical II strain suggested that we would find that the new consolidation was due to a pneumococcus of an entirely different strain. This patient received antipneumococcus (Type I) serum and made an uneventful recovery except for a moderate serum sickness. If he contracted the Type I infection from his shanty-mate in the hospital, it is interesting that he contracted a different type in the shanty.

Summary.—Examination of 100 specimens of sputum from healthy negroes living in the shanties of the Bethlehem Steel Works showed 22 per cent of pneumococci belonging to fixed types in contrast to 6 per cent of a group of our dispensary patients. The number of the ordinary saprophytic Type IV organisms was practically identical in the two groups. The increase in the fixed types was at the expense of the group that does not harbor pneumococci in their mouths. This high percentage of healthy individuals carrying pneumococci of fixed types in their mouths occurred in a community where the percentage of cases of lobar pneumonia due to organisms of fixed types was likewise very high.

TABLE 1.

SUMMARY OF CASES.

Type.	Black. Living.	Black. Dead.	White. Living.	White. Dead.	Total.
I	12	6	3	3	24
II	3	0	1	0	4
II (atypical)	7	4	0	1	12
IV	15	2	3	2	22
Ungrouped	1	1	0	0	2
Streptococcus mucosus	1	0	0	0	1
Friedländer's bacillus	0	0	0	1	1
Total	39	13	7	7	66

TABLE 2.

MORTALITY RATES.

Type.	Black. Per cent.	White. Per cent.	Mixed. Per cent.	
I	33⅓	50	41.7	
II	0	0	0	31.3
II (atypical)	36.3	100	41.6	31.3
IV	11.8	40	18.2	
Mixed	25	50	30.3	

TABLE 3.

PNEUMOCOCCI ISOLATED FROM MOUTHS OF HEALTHY INDIVIDUALS.

Type.	Sparrows Point (100 Cases). Per cent.		Dispensary (50 Cases). Per cent.	
I	6	22	0	6
II	6		2	
II (atypical)	4		2	
III	6		2	
IV	35		32	
None	43		62	
	100		100	

TABLE 4.

PNEUMOCOCCI ISOLATED FROM CASES OF LOBAR PNEUMONIA.

Type.	Sparrows Point. Number of Cases.	Sparrows Point. Per cent.	Baltimore City. Number of Cases.	Baltimore City. Per cent.
I	15	55.6	9	25.7
II	1	3.7	3	8.6
II (atypical)	8	29.6	4	11.4
III	0	0	0	0
IV	3	11.1	19	54.3
	27	100.0	35	100.0

TABLE 5.

MORTALITY OF SPARROWS POINT GROUP.

Type.	Number of Cases. Living.	Number of Cases. Dead.	Mortality Rate. Per cent.	
I	12	3	25	
II	1	0	0	33.3
II (atypical)	5	3	37.5	33.3
IV	2	1	50.0	
	20	7	35.0	

A STUDY OF THE BACTERIÆMIA IN LOBAR PNEUMONIA.

By ALAN C. SUTTON and CHARLES E. SEVIER.

(From the Medical Clinic of The Johns Hopkins Hospital, Baltimore.)

In this, as in most laboratories, it has for some time been the custom to do a blood culture upon admission in all cases of lobar pneumonia, and to identify, if possible, the type of organism responsible for the infection. In case the blood culture should be negative, the group determination is made with the organism recovered by culture or mouse inoculation from the sputum—a less certain method. Consequently, more than one blood culture was rarely made on each patient, unless some unusual feature of the clinical course suggested the need for further investigation. Records were not made in all cases of the degree of the bacteriæmia.

This year we undertook to make a daily blood culture in every case of pneumonia from the day of admission until the temperature (rectal) was below 100° F. This was carried out in all except the first seven patients of the season, who had blood cultures taken only on admission, all of which were negative. There was one other patient who died immediately on reaching the hospital before a culture was obtained. So far as we know, there is no similar study reported on a group of cases in which the strains of the pneumococci were also determined.[1]

We wished to determine the course of the sepsis in cases with positive blood cultures, to see whether this varied according to the type of infecting organism, and finally to determine the relation of the bacteriæmia to prognosis.

The method used in making the blood cultures is the usual one. A 10 c. c. Record syringe is used. First, 1 c. c. of a 1.5 per cent sodium citrate solution is drawn into the syringe. Then the syringe is filled to the 10 c. c. mark with blood. The blood and citrate are thoroughly mixed. Eight cubic centimeters of the mixture are plated with glucose-agar—in four plates. The remaining 2 c. c. are put into a flask containing glucose broth. Thus by using known amounts of blood and accurate dilutions the number of colonies per cubic centimeter can be determined. In cases with a severe sepsis much higher dilutions of blood are made. In these cases we use freshly made blood-agar instead of glucose-agar for plating.

[1] Dochez, A. R.: Jour. Exp. Med., 1912, XVI, 680.

The detailed results of the study are given in a set of tables. Each table shows all the cases in the series belonging to its particular strain. In Fig. 1 are shown all the cases due to the Type I pneumococcus. Only those cases with one or more positive blood cultures are represented graphically. The others, in which the organism was obtained only from the sputum, are tabulated merely in regard to the number of living and dead. Dots connected by solid lines represent the patients who died; rings are used for those who recovered. Broken connecting lines instead of solid ones are used during the period when the patients with a Type I infection received specific treatment with antipneumococcus serum furnished us by the hospital of the Rockefeller Institute. Lines of plus marks represent the period during which optochin was given. This was used in only two cases.

Of the 10 patients with positive cultures, only four recovered. Three of these had less than six colonies per cubic centimeter, and showed organisms at most on three days, one of them only once. The other, who received serum treatment, came into the hospital on the seventh day of the disease with 20 colonies per cubic centimeter. He received the first dose of 75 c. c. of serum on the day of admission and subsequent cultures were persistently negative. Of the six fatal cases, two of the patients died on the day of admission; one lived three days, showing an increasing bacteriæmia; the other three received serum treatment, which was followed by a reduction in the number of colonies per cubic centimeter in spite of the fatal termination.

None of the four cases due to the typical Type II organism had positive blood cultures.

The group of cases due to pneumococci that agglutinated atypically with Type II serum is given separately in Fig. 3. Of the 12 cases included under this head, seven gave positive cultures. Three of these had only one colony or less per cubic centimeter on from one to three days. Two had been negative on admission. The other came in on the third day, and his blood was positive only on the day of admission, showing only one colony in 3 c. c. of blood. All three recovered without complications. The four that died had marked grades

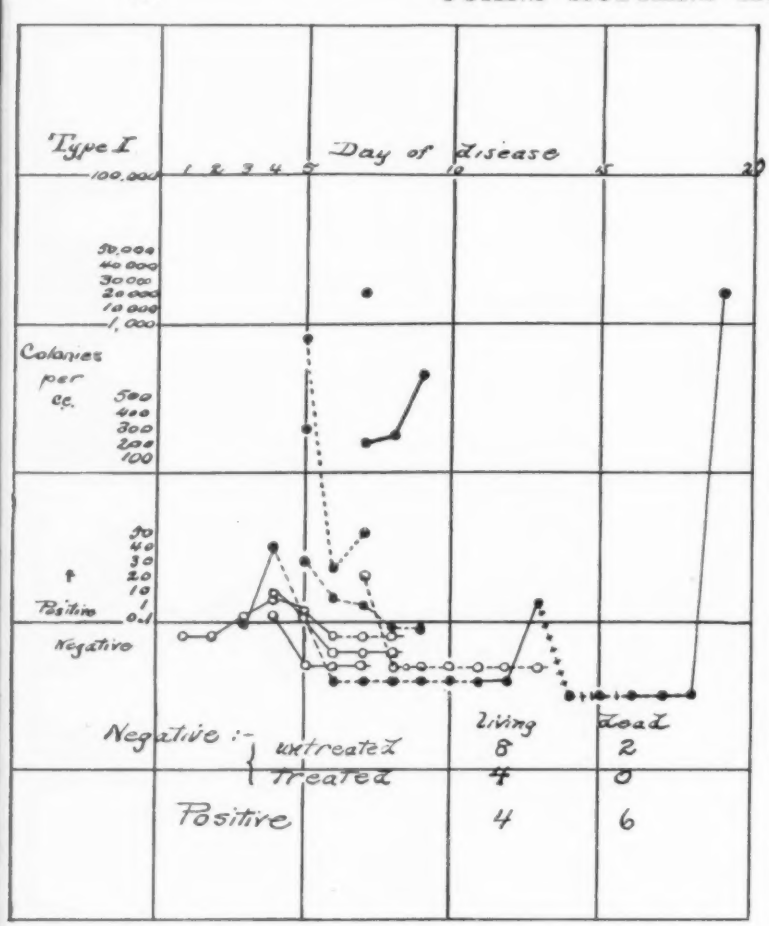


FIG. 1.

For figures 1 to 5:

Dots = Fatal cases.

Rings = Cases that recovered.

– – – – = Period of administration of Type I antipneumococcus serum.

+ + + + = Period of administration of optochin.

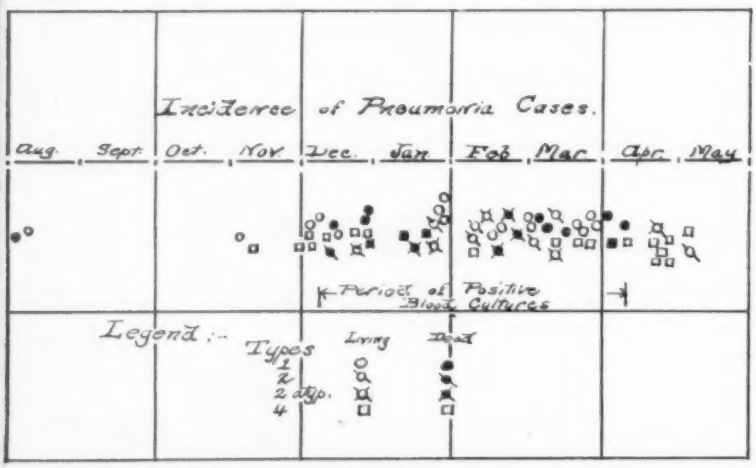


FIG. 6.

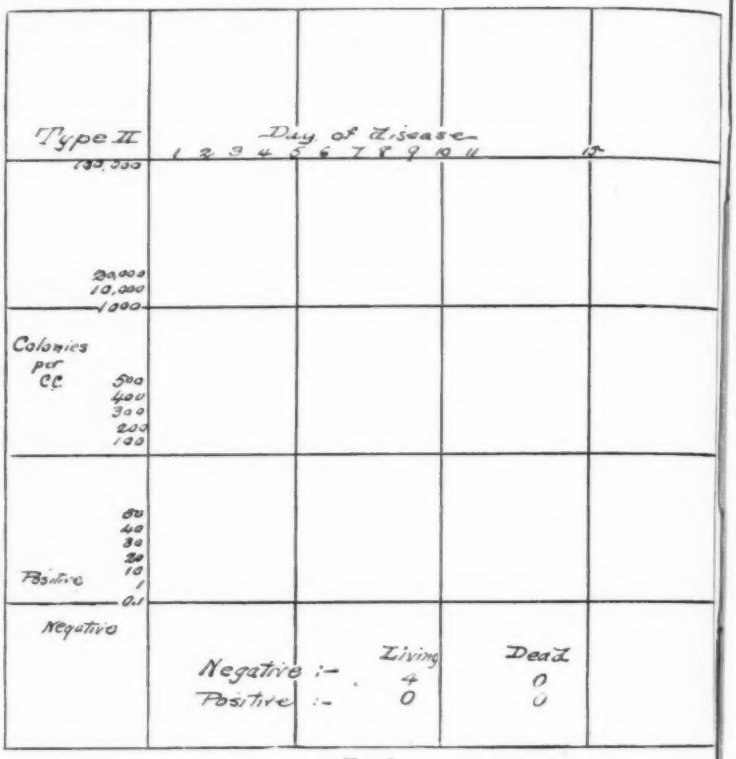


FIG. 2.

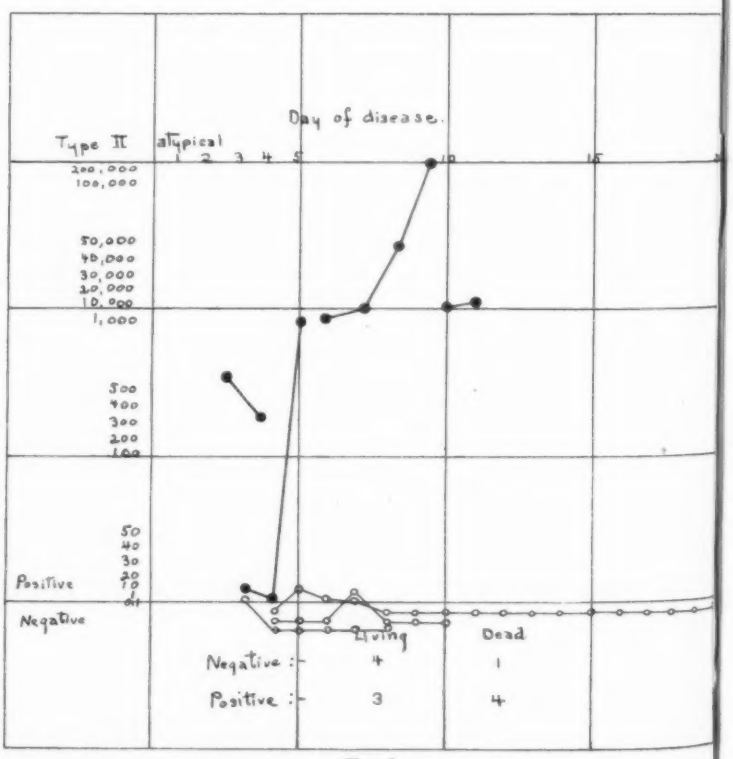


FIG. 3.

of bacteriæmia. One patient came into the hospital on the tenth day of the disease with a severe septicæmia and meningitis. He died the following day. The patient who entered on the third day with five colonies per cubic centimeter, which on the following day had dropped to less than one colony per cubic centimeter, suddenly developed within 24 hours a bacteriæmia of 1000 colonies per cubic centimeter and died. Autopsy revealed no complications whatever.

The cases not included under any of the fixed strains and commonly grouped as Type IV are shown in Fig. 4. They fall into two clean-cut groups: all the patients with positive blood cultures died; all with negative cultures recovered. The only case that showed a decrease in the grade of the bacteriæmia received optochin therapy. The optochin was not started until the tenth day; the decrease in colonies was coincident with its use.

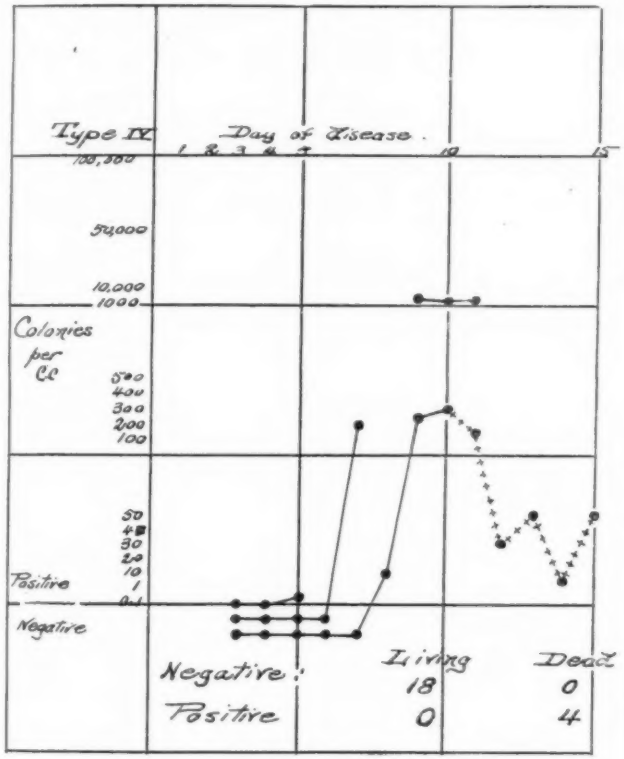


FIG. 4.

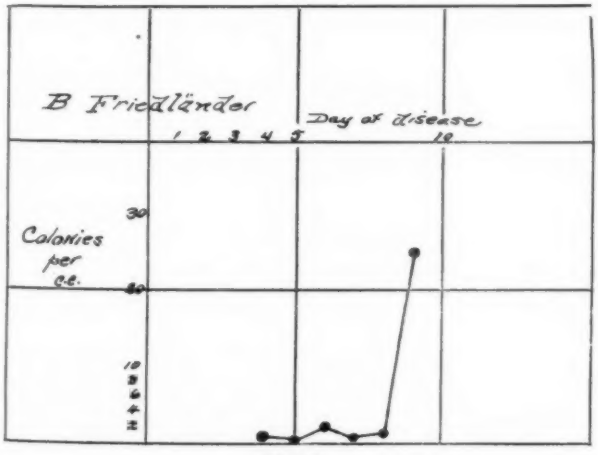


FIG. 5.

We had two cases of lobar pneumonia not included in the above groups. One is a case due to Friedländer's bacillus (*B. mucosus capsulatus*). The organism was isolated from the sputum and the blood. The course of the sepsis is given in Fig. 5. The patient was a white man, 52 years old, who came into the hospital on the fourth day of the disease and died on the ninth day.

The other case was caused by *Streptococcus mucosus*. It was agglutinated only by Type III serum, but was insoluble in bile and morphologically was not a Type III organism. The organism was not isolated from the blood. It was, however, gotten from the sputum in practically pure culture, twice by direct culture and once by mouse inoculation. That the organism was the one causing the pneumonia we feel is borne out by the fact that it was agglutinated by the patient's serum and not by normal sera.

From an analysis of all the cases the striking feature is the practical coincidence of the mortality percentage with the percentage of positive blood cultures. Consequently, the reason that the mortality rate of Type IV is low, while in some of the fixed types it is high, may easily be that the incidence of positive cultures is low, while in the fixed types it is high. The factors which determine whether a lobar pneumonia will run its course without bacteriæmia, with only an occasional organism in the blood, or will develop a severe septicæmia, are probably complex. The virulence of the particular strain is probably by far the largest factor, but does not seem to be the only one. Our highest bacteriæmia was noted in the case of a negro who came into the hospital on the sixth day of the disease. On admission he had 2000 colonies per cubic centimeter of blood. He lived four days with a rapidly increasing septicæmia that reached 180,000 colonies per cubic centimefer just before he died. The only complication was a purulent effusion in the right elbow-joint the day before death. The organism from this case was an Atypical Type II pneumococcus. Three weeks earlier we had a patient from the same locality, also with an Atypical Type II infection, who never had over one colony per cubic centimeter, and finally recovered after a long-delayed resolution. The organism isolated from the blood of the man who died was also agglutinated by the serum from the convalescent case.

Of the entire series of 66 cases only three patients died whose blood cultures were persistently negative. We secured autopsies on all three patients. Two died with massive lesions. In one of these all the lobes except the right middle were consolidated; in the other all but the right upper. In each case there was considerable amount of œdema of the uninvolved lobe. There were no complications. The patients died on the

sixth and eight days of the disease, respectively. In the third case the exact cause of death is obscure. The case stands alone in the entire series. The patient was a negro, 28 years of age. He had always been healthy. There was no evidence or history of anything more than a moderate use of alcohol. He entered the hospital on the third day of his illness, lived six days longer and then died. He had consolidation of the right upper and middle lobes only. There were no complications. Blood cultures were persistently negative. The case was one of Type I infection, but the patient did not receive serum treatment. He seemed no sicker than other patients with negative cultures before the crisis. His temperature ranged from 103° to 105° F. There was a leucocytosis varying between 20,000 and 25,000. His pulse was of good quality until the last day. He died in collapse, apparently exhausted by the so-called "toxemia."

Of the entire series no patient recovered who had, at any time of the disease, over five colonies per cubic centimeter of blood, whether he received specific therapy or not, with the exception of one patient who had 20 colonies per cubic centimeter on admission, and a severe alcoholic delirium. This patient, however, received serum within a few hours of admission, and subsequent doses until after his temperature had become normal.

Summary.—In Fig. 6 is shown the distribution of the cases throughout the year. The striking feature is that all the deaths, excepting that of the patient showing a negative blood culture, which is discussed separately, occurred in the four months between December 8 and April 8, although 16 cases occurred before or after this period. This is also the period within which all the positive blood cultures were obtained. Do the fixed types vary in virulence throughout the year, or does the severity of the initial exposure during the period of maximal changes in weather predispose to the type of pneumonia that runs its course with a septicæmia?

The results of the series are summarized in Table 1. In general, the incidence of septicæmia runs parallel with the mortality. If the cases with a transient sepsis, having only an ocasional colony early in the disease, are omitted, the percentages of positive blood cultures and mortality are practically identical.

The fatal cases fell into three groups:

1st. The patients dying with a septicæmia. This group included all but three cases.

2d. The two patients dying with almost complete consolidation of both lungs.

3d. The single patient dying apparently "of toxemia," with negative blood cultures and only moderate consolidation.

Finally, as regards prognosis, we have found blood cultures the most valuable aid. Ninety-three per cent of our patients with persistently negative blood cultures recovered without any complications. Of the patients with positive cultures, all with over five colonies per cubic centimeter at any period of the disease died, except one with 20 colonies on admission, who received serum therapy.

TABLE 1.

Types.	Percentage of positive blood cultures.		Mortality percentage.	
I	45.8		41.7	
II	0	43.8	0	31.3
II (atypical)	58.3		41.6	
IV	18.2		18.2	

ON THE MECHANISM OF CONVULSIVE PHENOMENA AND ALLIED SYMPTOMS.*

By C. Macfie Campbell, M. D.

It is difficult in medicine to escape the narcotic influence of names and to keep alive a healthy curiosity as to the facts of experience and their interrelation.

Names, like the ideas of Plato, impose on us as objective entities outside of the individual facts. So in dealing with convulsive and allied phenomena, it is not easy to free oneself from the baleful influence of the words epilepsy and hysteria, and to think in terms of the modes of reaction of living organisms. It is, however, when we succeed in the effort to think in such terms that we are most likely to do justice to the individual case.

I propose, therefore, to discuss a few cases in such terms, not in the hope of throwing any light on nosological entities, but to see whether the symptoms can be made more or less intelligible.

To illustrate the point of view, one may take a symptom like headache and study the various settings in which it occurs. In some cases headache is adequately explained on a toxic basis, *e. g.*, the headache of kidney disease; at an equally simple level we can discuss the headache of brain tumor. In other cases the headache arises in the setting of an emotional reaction, and in emotion we deal with a more complex functional unit than is involved in discussing toxins and elimination, tissue anomalies and intracranial pressure.

In the case of other headaches we have to pass beyond the simpler conceptions of instinct and emotion and have to introduce associative material; the headache may become intelligible only when we consider those organized forces or trends that are grouped together under the conception of the subconscious, or whatever term may prove more acceptable to the purist. Still other headaches are woven into the conscious adaptation of the individual to his tasks, and help us to escape

* Read as part of a Symposium on Epilepsy and Allied Conditions at Randall's Island, New York City, June 4, 1917.

importunate visitors or to evade distasteful tasks, although with twinges of conscience.

To endeavor to find one simple formula suitable for all headaches would be a vain task; the symptom may be determined at any one of several levels, the ascending levels of organic integration.

The situation is further complicated by the fact that the symptom may be determined in the same case by factors at more than one level. Megrim headache, about which so little is known, may be assumed to arise at a simple level and not to require explanation in terms of the more complex factors of the personality; but in the case of the migrainous daughter of a migrainous mother, where the daughter has many repressed and poorly digested instinctive problems, who can apportion correctly the respective rôles of simple pathological physiology, of subconscious forces and of conscious adaptation?

The same problem meets us in relation to many other nervous symptoms, such as bed-wetting, night-terrors, choreiform movements, stammering. The latest achievements in psychopathology have shown us how complex may be the determination of even a simple symptom like bed-wetting. A young man of 18 had an isolated incident of bed-wetting after his father had urged him to make a public appearance from which he shrank; to understand the symptom it was necessary to descend to the roots of the personality. While such facts have to be recognized, one is entitled to protest against the formulation based on such a case being generalized, and applied to other cases which may be adequately formulated in terms of injudicious fluid intake, poor training, physiological inadequacy or simple emotional disturbance.

In relation to night-terrors, I see no reason to assume that this symptom must always involve reference to the most complex adaptive mechanisms, and may not sometimes arise at a much simpler level. I am well aware that night-terrors may be of most complex origin, that they may indicate tension in the most highly organized trends of the individual, and may spring from a blend of desire and aversion in relation to the fundamental instincts. The counterpart of night-terrors of such origin is to be seen in the waking life in the attitude towards something at once desired and dreaded, the anticipation of a mystery at once fascinating and terrible. All this may very well be true, and yet in other cases the symptom may arise at a much simpler level, and may require no reference to the complex elaboration of instinctive forces.

Choreiform movements in some cases are considered to be purely toxic manifestations (Sydenham's chorea), but similar symptoms may arise in the absence of toxic factors, as an adaptive mechanism by means of which repressed forces express themselves in a permissible disguise. Where a hysterical child, with a previous attack of Sydenham's chorea, seems to have a relapse, it is impossible to disentangle completely the rôle played by the impersonal factors from that played by the more complex determinants of human behavior.

With these facts in mind, one comes to the study of convulsive and associated phenomena with an open mind, willing to receive help from the most detailed chemical or histopathological studies as well as from the most detailed psychopathological researches, such as the recent work of Dr. Pierce Clark, and not disposed to see any opposition between the two lines of study. One will neither deny the value of psychopathological interpretations because some cases seem to be adequately explained on more elementary principles, nor will one employ psychopathological explanations as general formulæ applicable in all cases.

In a graduated series of convulsions or allied phenomena, ranging from those of simple to those of complex determination, the convulsions of uræmia and general paralysis would represent one end of the scale; at the other extreme would be cases in which the attacks have to be expressed in terms of adaptive activity with conscious and subconscious determinants.

The latter group may be illustrated by the case of a young man * of 21, a farmer, who was brought to the hospital owing to a series of convulsions during the previous three days; he had been subject to attacks for several years. In the brief stay in the hospital he had several attacks, during which he thrashed around wildly and for which he professed complete amnesia; he also claimed amnesia for two episodes of elaborate pantomime which occurred in the hospital. On the fourth day after admission he was impatient to leave the hospital and said that he could control the attacks at will; that they had been developed in order to relieve him from uncongenial work. The reason why this method of evasion had been chosen was because these attacks came very easily; he had between the age of 6 to 14 lived near an epileptic boy and had frequently imitated his fits. Such was the explanation given by the patient.

It would, however, be rather crude to accept this formulation as an adequate analysis of the whole situation. The fact that in boyhood he had reacted to the fits of his comrade by imitating them shows a peculiar responsiveness to a rather dramatic situation, a tendency to identify himself with the hero of the mysterious sickness, a facile translation of the phantasied activity into real movements on his own part, an absence of inhibition by those restraining forces which are the most valuable elements in personality.

The patient's statement that he imitated the other boy's fits meant no more than that the more or less automatic dramatization of the attacks was unchecked by trends of a higher level, but was in harmony with the conscious directing forces of the personality, *e. g.*, love of prestige.

The earlier episodes in imitation of the epileptic boy and the later episodes under the stress of uncongenial work were not to be understood in the light of some abstract fiat of the will, but as the expression of a special organization of the instinctive and affective life of the patient. It may even be debated whether such a constitution does not include a special facility or explosiveness of motor discharge, and whether the

* This case was the subject of a communication made by Dr. J. E. Eidson before a joint meeting of the Washington Psychiatric Society and the Maryland Psychiatric Society of Baltimore, March 28, 1917.

patient did not imitate the convulsions of the epileptic boy because of his constitutional kinship to the latter; there is much truth in the French dictum that one only simulates what one has. The patient was self-willed, superficial, unduly ambitious, with an extremely violent temper; his memory had somewhat deteriorated.

The analysis of such a case, in terms of the different levels at which the symptoms are determined, offers more than does its exclusive reference to one of a series of diagnostic alternatives—malingering, hysteria, epilepsy.

In the following case there was no indication of the collaboration of the official personality in the development of the attacks.

The patient, a lad of 18, like the former patient, was a farmer, to whom his work was uncongenial. At 13 he began to be nervous, shaky, and subject to palpitation; at 17 one day he had a brief episode of faintness and dizziness; next day he fell unconscious, but did not have any jerking or loss of sphincter control. During the following year he was subject to attacks of weakness and dizziness with shortness of breath and palpitation. In the hospital there was noted only slight enlargement of the heart, slight respiratory irregularity of the pulse, a pulse rate of 90 to 100 per minute, and profuse sweating of the hands and feet. When venapuncture was performed, the patient became pale and lost consciousness; there were slight convulsive movements of the legs and arms, and of the jaw; a large amount of gas and a small amount of fæces were passed involuntarily. The whole episode lasted about one minute, and in half an hour he was in his usual condition.

Three weeks later when lumbar puncture was attempted the patient complained of feeling faint, had a slight general convulsion of less than a minute's duration; there was no loss of sphincter control. The pulse dropped to 39 per minute, the skin was cold and pale. The patient claimed to have been conscious but unable to talk during the attack.

Lumbar puncture next day was followed by headache and vomiting. On the following day the patient had an attack lasting half an hour; the movements suggested those of coitus, the attack finished with a long sigh and general relaxation, but there was no erection nor emission. He could not be roused during the attack and had no memory for what transpired during the attack.

In this case determinants at the conscious level were not elicited; the attacks were to be considered either as the expression of factors at the subconscious level, or the expression of an idiosyncrasy of emotional reaction at the physiological level, or of a combination of these two factors. The rôle of subconscious sexual phantasies, strongly suggested by the last attack, may also have been important in the two earlier attacks, the reaction to the insertion of a needle.

It is, however, premature to assume that in all cases of fainting on trivial operations or at the sight of blood, the main determinants are subconscious phantasies; we must allow the possibility of individual idiosyncrasies of emotional reaction. The general nervousness of the patient from the age of 13 and the earlier attacks of dizziness and weakness may have been determined neither at the instinctive nor at the subconscious level, but at the same level as the irregularity of the heart, and the profuse sweating.

According as one emphasizes the physiological idiosyncrasy on the one hand, or the rôle of repressed trends on the other, the case will be referred to epilepsy or to hysteria. As a matter of fact, the case is only adequately grasped when justice is done to both mechanisms. Can the discredited term hystero-epilepsy not be used in a perfectly honest and definite way?

The following three cases illustrate more clearly the rôle played by the elementary physiological and emotional idiosyncrasy, while more complicated adaptive mechanisms are not in evidence.

A boy, seven and a half years of age, rather restless, with an irritating cough, given to violent tantrums, was subject to pain in the epigastrium on rising, and on his return from school. The pain was liable to appear under the stress of emotion. "If he gets frightened these pains come on him right away and make him pale and sick." One day he cut his finger, whereupon he fell on the floor, foamed at the mouth and kicked. On the following morning without known cause he had a similar attack. During the following year he has had no further episode; the irritating cough has disappeared.

A boy of 10, somewhat spoiled and irritable, on arising in the morning would be extremely pale and complain of malaise. He slept badly and had little appetite. On three occasions he fainted, the first time when he was vaccinated; the third time was at the age of nine during a physiology lesson at school. On the last occasion he was said to have been unconscious for over an hour. In the course of frequent interviews no psychogenic factors were apparent; careful examination of the heart disclosed no lesion, and improvement of his condition soon followed a healthy regime.

A girl of eight for several years had been subject to attacks of convulsive twitching, usually nocturnal; in the first attack she was apparently unconscious. One day she was bitten by a cat; when her father told her that she should suck the poison out of such a wound she became unconscious; her face and hands twitched. No psychogenic factors were elicited; the patient was a serious and conscientious child, somewhat reserved, subject to outbreaks of temper, rather dreamy, not much interested in her school work.

While in the two young farmers discontented with their work the symptoms seemed to require reference to the complex mechanisms of adaptation, in each of these three last cases we see one particular weak spot: In the first, epigastric pain is prominent; in the second, a vasomotor anomaly; in the third, muscular twitching; in each we see an idiosyncrasy in emotional reaction.

For the formulation of these cases physiological categories and those of the simple instinctive and emotional life may perhaps be sufficient.

An extremely important question is that of the rôle which these more fundamental disorders will play in the later adjustment of the individual. Will they be modified by good regime

and sound training, or will they become more deeply rooted through poor regime and habit and emancipate themselves completely from the control of the personality, conscious or subconscious; or will they be the handmaids of the subconscious and go halfway to meet its demands? So far as I know, at the present time these questions cannot be answered on the basis of clinical experience.

The emancipation from personal control of a motor reaction may be seen in the tic, or motor habit, which starting in the beginning as an adaptive act, subject to personal control, finally becomes independent and compulsive. The transition from the purposefully controlled to the independent and emancipated reaction may even be followed in such a complex type of reaction as the catatonic syndrome; this was the case in a patient accused of murder, who immediately after an interview with his lawyer developed a catatonic syndrome, which on later examination was found to have emancipated itself from the control of the personality (personal communication from Dr. Wm. L. Russell).

The same point of view may be illustrated by a second series of cases, presenting one symptom in common, namely, that of sudden and overpowering somnolence.

A young man of 19 complained of being frequently overcome with sleep even during conversation or walking. He attributed the condition to the fact that from the age of 14 he had deliberately cultivated the habit of falling asleep during tedious study hours. After a few months' practice he had become such an adept that he had merely to put his head down on the desk in order to fall asleep. He continued to indulge in this habit, but for more than a year previous to his admission to the hospital the habit had emancipated itself from his control; during reading, if he thought of sleep, he would drop off to sleep for an hour or so; the thought of the awkwardness of an attack during a conversation brought on sleep immediately. On one occasion he several times fell asleep at the wheel of his automobile and narrowly escaped disaster. In walking he would have brief spells of sleep and almost fall. The patient showed excellent physical health; there was no evidence of dyspituitarism.

The patient's explanation that the condition was merely the result of a habit is obviously inadequate. The sleep habit is not so easily cultivated and depends to a large extent on personal idiosyncrasy. For sleep to have been so successfully cultivated until finally it emancipated itself entirely from the patient's control, a very marked individual idiosyncrasy must be postulated. Deeper affective roots of the disorder or any special adaptive values were not to be traced; it did not seem to have anything in common with the prolonged sleep of some depressions, nor with the defensive mechanism of stuporous conditions. One was entitled to assume that what appeared to be the product of voluntary habit formation was in major part due to latent constitutional idiosyncrasy; just as the artificial convulsions of the young farmer were not altogether to be credited to his higher level mechanisms.

That the sleep mechanism may have a certain independence is shown by Gélineau's case,[1] where there was no question of deliberate cultivation, but where the symptom developed, at least at the beginning, in an emotional setting. The patient, a cooper of 36, found that, if he laughed heartily or contemplated a profitable piece of business, his muscles would become limp and he would fall asleep for a minute or so. Later the condition developed to such an extent that he would fall asleep several times during a meal. Although the observation does not include an intensive study of the personality and of possible undercurrents, it suggests the possibility of a more or less special type of reaction not of an adaptive nature, but based on a personal idiosyncrasy, at first elicited in relation to the emotional life. Further studies may demonstrate the adaptive nature of this reaction and may trace it to its subconscious and instinctive roots, but we are not entitled to assume that special subconscious factors are concerned in its production.

Reference may also be made to Löwenfeld's case,[2] a boy of 17, who from the age of 13 showed a pronounced tendency to fall asleep suddenly at very frequent intervals. This seriously interfered with his school work, and later with his work in a factory. If he laughed, his muscles would relax, he would stagger, his knees gave way, he had to hang on to some support, he was liable to drop objects.

The imperative onset of sleep and the peculiar relaxation of the motor apparatus during laughter are interesting in view of the relation of the attacks of sleep in Gélineau's case to pleasurable excitement.

In cases like the following there is still less suggestion of the symptom being other than a deep-rooted constitutional anomaly, unexplained by any special associative material. The patient, a Polish boy of 15, had at the age of six and again at the age of nine been subject to spells in which he would sit down and fall asleep. At the age of 15 the spells returned; the patient would suddenly appear to fall asleep, and would sink upon a chair or fall to the floor. The eyelids would contract convulsively for a few minutes, the teeth be clenched, but the tongue was never bitten. There were no clonic or tonic movements of the limbs. The boy would seem to sleep for about 25 minutes and then would wake up. The patient was of very limited intelligence and had been unable to get beyond the third grade.

In this case the attacks had neither been encouraged by the boy, nor had they appeared in any special emotional setting; they seemed to have no relation to the complex factors that make up the personality, but to be related to the lower levels of the patient's reactive mechanism.

SUMMARY.

The review of cases of convulsive and allied phenomena discourages the application of a general formula to all cases, or the distribution of the cases among a limited number of nosological entities, hysteria, epilepsy, psychasthenia, etc. In each case the problem is: How far can we deal adequately with the symptoms in merely physiological terms, how far must we take into consideration the instinctive and emotional patterns of reaction, to what extent are the complex factors of the sub-

conscious and the conscious life involved in the development of the symptoms?

Where the symptoms occur in early life the prognosis must be made after a careful estimate of all the reactive assets of the individual, and not merely on the basis of statistical probabilities. The treatment must be directed not merely to the demonstrable or hypothetical physiological anomalies, but must take into consideration the formation of habits, the regulation and assimilation of the instinctive and emotional life, the forces involved in the interplay between the subconscious and conscious realms.

Perhaps some symptoms which on statistical grounds are far from encouraging may be modified by good regime and wise training, a fair environment and sound mental hygiene, and may disappear instead of becoming fixed through habit and emancipating themselves from the controlling forces of the personality.

REFERENCES.

1. Gélineau: Sur la narcolepsie. Gaz. des hôp., 1880, p. 626.

2. Loewenfeld, L.: Ueber Narkolepsie. Münch. med. Wchnschr., 1902, S. 1041.

THE FASCIOLOPSINÆ OF CHINA: A STUDY OF TWO SPECIES FROM CHEKIANG PROVINCE.

By N. Worth Brown, M. D.

(From the Clinical Laboratory of The Johns Hopkins Hospital and Medical School, Baltimore.)

On the Eastern coast of China, particularly in the Province of Chekiang, are districts in which large numbers of the population harbor intestinal parasites identical with, or closely allied to, *Fasciolopsis buski*. These parasites have been frequently reported by medical missionaries and port physicians. Specimens have been sent to this country and to Europe for identification, descriptions of which conform to the general type discovered in 1843 by Busk, described by Lankester in 1857, and later by Looss (1899), Stiles (1901) and Odhner (1902). Ward in 1909 described three species from this section of China, recognizing *F. buski* and *F. rathouisi* (Poirier, 1887) and distinguishing from them another for which he proposed the name *F. goddardi*. In 1909 Rodenwaldt described an intestinal fluke from Egypt, *F. fülleborni*, which very closely resembles *F. buski*. From South China, from Cochin-China, from India and from Natal, specimens of *F. buski* have also been reported.

The material upon which the following report is based was secured from the Baptist Mission Hospital in Shaohsing, Chekiang Province, through the kindness of Dr. F. W. Goddard and Dr. C. H. Barlow. There were in all 188 specimens carefully preserved in moist alcohol packs. These preserved specimens were grayish-white in color but many of them retained a shade of the original reddish-brown. They measured in length from 17 to 48 mm., in width from 7 to 17 mm., and in thickness from 1 to 4 mm. In some the vitellaria could be clearly outlined through the overlying tissues. In certain specimens the acetabulum was more conspicuous than in others. Some were tongue-shaped, elongated, thin, and flexible; others were oval in shape, firm and stocky. The form varied greatly and it was evident either that *F. buski* was susceptible to marked deviations from a common type or that there were included in this assortment more than one species.

Of the specimens in hand, 18 were stained, cleared and mounted in balsam under very gentle pressure. The cuticle was removed from six. The cirrus pouch was dissected out, stained and mounted from four specimens. Freehand sections were made from six and microtome sections from five specimens. Ova were removed from the lower metraterm of 12. About half of the total number were photographed. From gross appearances the specimens were divided into two general groups. In Group I were placed the long, flexible flukes with irregular contours and conspicuous vitellaria. Group II included the specimens more nearly elliptical, smoother, thicker and with more prominent ventral suckers. After this arbitrary division had been made, it was found that the flukes in Group II possessed cuticular spines, whereas those in Group I were uniformly unspined. Of the total number, 105 were spined, 83 were smooth.

Group I.

The general appearance is that of long, flat, tongue-shaped fasciolopsinæ with irregular contours. The color of specimens after preservation in alcohol is grayish-white with marginal pigmentation representing the distribution of the vitellaria (Fig. 1). In length they measure from 21 to 48 mm., in breadth from 7 to 15 mm. and in thickness from 1.5 to 3.3 mm. The average size of twenty typical mature specimens is 36.7 by 11.2 by 2.1 mm. The surface is smooth and glistening The dorsum is covered by a much thickened cuticle. There are no cuticular spines.

The ventral sucker is large and muscular, irregularly bell-shaped, with the acetabular disc at its base pointing forward and downward. It is provided with radial and circular muscle fibres. The size and shape of the acetabulum and of its suctorial disc vary in different specimens, depending largely on the contraction or relaxation of its musculature. The ventral sucker measures from 2.65 to 3.0 mm. in length, and from 1.95 to 2.6 mm. in width, with an average of 2.86 by 2.24 mm. The acetabular disc measures from 1.15 to 1.6 mm. in its transverse diameter, and from 0.7 to 1.2 mm. between the anterior and posterior margins.

The cephalic cone is blunt and not clearly defined. The oral sucker projects ventrad from the anterior extremity of

the cephalic cone. Including its musculature it measures from 0.5 by 0.3 mm. to 0.6 by 0.35 mm. The transverse diameter of the oral aperture is from 0.2 to 0.4 with an average of 0.31 mm. The oral canal passes upward and backward through the sucker into a pre-pharyngeal dilatation limited by a pre-pharyngeal sphincter, then through a large globular pharynx, somewhat flattened in its antero-posterior diameter, through a very short esophageal constriction and into the transverse portion of the intestine lying between the pharynx and the cirrus. The pharynx measures from 0.6 to 0.9 mm. by 0.5 to 0.65 mm., averaging 0.7 by 0.58 mm. The cæca pass toward the lateral margins, curve around the ventral sucker and extend backward, the blind ends almost meeting at the posterior extremity. At the level of the shell-gland and between the two testes the cæca curve inward toward the median line. The cæca in this group are characterized by the absence of irregular convolutions, by uniformity in size and by a relatively large lumen. The cæca measure in diameter from 0.25 to 0.45 with an average of 0.36 mm. (Figs. 3, 4, 5).

The male reproductive system consists of large, ramified testes situated in the median field, one behind the other, occupying the posterior two-thirds of the fluke. A delicate vas efferens leading forward from the transverse axis of each testis, passes above and to the side of the shell-gland, over the uterine coils and, joining the vas efferens from the opposite side, enters the cirrus pouch at its posterior extremity. This pouch extends as a large, convoluted muscular tube from a point about midway between the acetabulum and the shell-gland, often nearer the latter, to the ventral sucker where it becomes cylindrical, rapidly narrows, curves over the body of the sucker and terminates in the genital cloaca just in front of the anterior margin of the acetabulum. The convoluted portion is from 3.0 to 5.0 mm. in length, and from 0.55 to 1.3 mm. in diameter. The structure of the cirrus corresponds to that of Group II under which it is more minutely described. The lower portion of the cirrus is evaginated and protruded in 29 out of 55 specimens. The protrusion of the cirrus is accompanied by an evagination of the genital cloaca. This condition closes the opening from the metraterm and perhaps gives predominance, temporarily, to the male functions in the sexual life of this hermaphrodite (Figs. 17, 18, 20).

The vitellaria extend marginally from the level of the acetabulum to the posterior extremity where they intermingle with those from the opposite side. The vitelline acini are exceedingly numerous and vary in size from 0.05 to 0.12 mm. The ducts from these glands unite to form the right and left vitelline ducts which meet and enter the shell-gland located in the anterior portion of the middle third of the fluke. The shell-gland is oval and measures on the average 1.6 by 1.3 mm. Viewed from the dorsal surface a coarsely branched ovary lies to the right and slightly anterior to the shell-gland (Figs. 4, 15). The uterus is much coiled and varies greatly in diameter. Distended portions measure from 0.4 to 0.8 mm. The metraterm extends from the large uterine coils to the cloaca, passing over the acetabulum, parallel with, and to the left of, the ejaculatory duct and opening at the side of the latter in the genital pore.

An excretory vesicle can be demonstrated in mounted specimens. It begins in two main branches, one on each side of, and anterior to, the shell-gland (Fig. 4). These pass backward and join behind the shell-gland from which point the vesicle extends posteriorly, as a median canal with numerous tributary branches, to the foramen caudale. This is a small depression on the dorsal surface, 0.5 mm. from the posterior extremity, surrounded by circular striations giving it a sphincter-like appearance. The caudal extremity frequently shows a small median fissure leading toward the excretory pore (Figs. 4, 16).

The ova are large, oval, thin-shelled, pale yellow in color and contain a nucleus and yolk cells. The operculum is fairly large in eggs taken from the lower portion of the metraterm (Figs. 25, 26, 27). The measurements of 36 typical eggs are:

Length	**0.120 to 0.138 mm.**	**Average 0.128 mm.**
Width	**0.072 to 0.094 mm.**	**" 0.084 mm.**
Operculum	**0.027 to 0.035 mm.**	**" 0.031 mm.**

GROUP II.

The flukes in this group are thick, firm, oval in shape, smaller and more constant in size and form than those of Group I (Fig. 2). The cephalic cone is small but clearly defined on lateral inspection. The specimens tend to assume a dorso-concave position with the cone sharply ventro-flexed. Occasionally this position is reversed. The color of the preserved specimens is lighter than in Group I. The vitellaria cannot be clearly distinguished through the overlying tissues. The measurements of 25 typical specimens are:

Length	**17.0 to 30.0 mm.**	**Average 25.4 mm.**
Width	**7.5 to 13.0 mm.**	**" 11.4 mm.**
Thickness	**2.3 to 3.3 mm.**	**" 2.6 mm.**

The surface is smooth and unwrinkled. The dorsal integument is thickened as in Group I but on the ventral surface cuticular spines are present. In some specimens the entire ventral surface is thickly covered; in others the spines are found chiefly on the anterior third and are most numerous in the region about the oral and ventral suckers and along the lateral portion of the ventral surface extending inward about half-way to the median line. In one area a count showed approximately 250 to the square millimeter. Except for small areas on each side of the cephalic cone and for a short distance over the lateral margins, the spines are confined to the ventral surface. There is considerable variation in the size and shape of these cuticular spines. Marginal spines and those on the cephalic cone appear as sharp spicules from 0.04 to 0.07 mm. in length. On the ventral surface they are wedge-shaped, from 0.03 to 0.05 mm. in length, from 0.02 to 0.035 mm. in width and from 0.01 to 0.015 mm. in thickness at the base gradually diminishing toward a distal edge. From above they appear as scales deeply embedded in the cuticle, the free edge being irregular in contour, somewhat rounded and a little broader than the base (Figs. 9, 10, 11, 13, 14).

The ventral sucker presents no variation from the type described under Group I, except that it is appreciably larger.

It measures through its musculature from 2.75 to 3.20 mm. in length, by 2.10 to 2.70 mm. in width and averages 3.01 by 2.34 mm. The oral sucker is subterminal as in Group I. It measures on the average 0.58 by 0.35 mm., while the oral aperture is 0.32 by 0.13 mm. A pre-pharynx is present. The pharynx measures 0.82 by 0.65 mm.

The cæca present certain characteristic variations from those in Group I. In addition to the two typical inward curves there are frequent irregular convolutions especially prominent in the anterior portion of the worm. There are also numerous constrictions and dilatations. The diameter of the gut is from 0.16 to 0.23 mm. whereas in Group I it measures from 0.25 to 0.45 mm. The cæca are relatively longer than in the first group and may be roughly estimated at twice the body length (Figs. 6, 7, 8).

The size of the cirrus pouch and the branching of the testes vary somewhat in the individuals of each group. The ramifications of the testes are perhaps more numerous and denser in the spined than in the unspined worms. The cirrus pouch is convoluted as in Group I, but is less conspicuous and measures from 0.4 to 0.6 mm. in its greatest diameter (Fig. 19). The cirrus is protruded in only a few specimens of this group. As the vasa efferentia enter the adventitious tissue surrounding the cirrus pouch they unite and open, within the cirrus pouch, into the large convoluted portion of the vas deferens. This extends almost to the ventral sucker and constitutes the vesicula seminalis from the anterior portion of which is giving off a large diverticulum. This appendage is projected backward in irregular convolutions beside the seminal vesicle and within the cirrus sac almost to its posterior limit (Figs. 21, 30). The seminal vesicle and its appendage are lined with cylindrical epithelium. The lumen of the diverticulum, or seminal pouch, is larger than that of the seminal vesicle and contains great numbers of spermatozoa. It apparently functionates as a seminal reservoir (Fig. 22). Above the dome of the ventral sucker the vas diminishes to a diameter of 0.2 mm., its muscular structures become more prominent and the epithelium becomes definitely of the columnar type (Fig 23). This portion of the vas serves as an ejaculatory duct and extends to a point about 2 mm. from the genital pore, where the duct becomes much constricted and is surrounded by a strong muscular sphincter 0.3 mm. in length. Below this sphincter is the cirrus proper, a muscular structure from 0.6 to 0.9 mm. in length, the distal extremity of which projects into the terminal portion of the canal. The latter is approximately the same length as the cirrus. Its lumen varies in size and is beset with numerous minute triangular spines. When the cirrus protrudes through the genital pore, this pre-cirral canal becomes completely evaginated and the spines which line its lumen appear on the surface of the projecting cirrus (Fig. 31).

The vitelline glands are as in Group I, but not usually so closely confined to the lateral margins. The acini vary in size but on the whole are slightly larger than in the unspined worms and measure from 0.07 to 0.16 mm. The shell-gland is noticeably longer in its longitudinal axis. It is oval and measures from 1.6 to 2.2 mm. by 1.0 to 1.3 mm., with an average of 1.9 by 1.1 mm. The uterus is more tightly coiled than in the first group. Its lumen is smaller and in none of the spined group does it exceed 0.45 mm. in diameter. The location and appearance of the ovary, the course of the metraterm and its opening in the genital pore, the excretory vesicle and the caudal foramen, are as described under Group I.

The ova, similar in general appearance, differ in size and shape and in the relative size of the operculum from those of the unspined worms. The measurement of 64 typical eggs gives the following:

Length	**0.130 to 0.160 mm.**	**Average**	**0.138 mm.**
Width	**0.070 to 0.095 mm.**	"	**0.082 mm.**
Operculum	**0.016 to 0.032 mm.**	"	**0.023 mm.**

Eggs of very unusual size and those showing distortion or shrinkage are not included. In general, ova from the spined group are longer, relatively narrower and possess a more delicate operculum than those of the flukes under Group I (Figs. 28, 29, 30).

With minor exceptions the specimens of Group I correspond to the accepted descriptions of *F. buski*. Mature worms, however, differ from the description given by Odhner in that the cirrus pouch is definitely convoluted, the shell-gland is oval and located in the anterior portion of the middle third of the fluke. *F. fülleborni*, as described, bears a very close resemblance to the flukes of Group I. The location, size and shape of the shell-gland, the large convoluted cirrus sac, the absence of cuticular spines and other general characteristics would seem to identify the largest of our parasites with this species. In Group I, however, there are mature, uncontracted worms much smaller than those described by Rodenwaldt. The gradation in size from smallest to largest is complete and structural characteristics remain constant. Reported measurements of the ventral and oral suckers have led to confusion. Some observers give the dimensions of the acetabular disc, some of the acetabular ring, whereas others include the entire musculature of the organ. This fact may account for the discrepancy in measurements between this and other reports.

The presence of cuticular spines was not mentioned in the earliest descriptions of fasciolopsinæ from China. The pressure used in mounting specimens is often sufficient to squeeze the soft, thick dorsal cuticle over the edge of the parasite and thus obscure marginal spines. Ventral spines are not easy to demonstrate with the methods ordinarily employed.* Specimens from Cochin-China, presented to the Hygienic Laboratory of the United States Public Health Service, by Barrois and Noc and designated by them as *F. buski*, were found on examination to possess cuticular spines. Leiper (1911) reports the presence of spines in both *F. rathouisi* and *F. goddardi*. Heanley (1908) states that all *F. buski* in South

*** To determine the presence of spines, immerse the fluke, ventral surface upward, in water and with a strong light directed from above (a small arc is desirable) examine under the microscope using a No. 3 objective and a high ocular. Transmitted light will reveal marginal spines. Portions of the cuticle may be removed and mounted for examination under higher magnification.**

China are spined. Commenting upon this observation Leiper suggests that spines may be characteristic of all fasciolopsinæ and that the decidual character of the integument explains the absence of spines in specimens described as *F. buski*. It is possible that vigorous manipulation or the action of chemicals used in the preservation of specimens or the preparation of mounts may result in disintegration of the cuticular layer, and yet in our experience the material studied has been subjected to all customary laboratory methods including embedding and sectioning without evidence of extensive desquamation and without destroying the spinous character of the integument.

It may be contended that the possession of spines represents only a stage in the life history of these parasites. This is improbable, as both young and fullgrown specimens are found in each group and there are, moreover, other less conspicuous features already enumerated, characteristic of each group, which remain constant notwithstanding wide variations in size and development. Since both auto-copulation and cross-copulation occur among trematodes it is not inconceivable that in such closely allied species hybrid forms might appear. Such an assumption would not militate against the consideration of these two groups as distinct species, conveniently differentiated by the presence or absence of cuticular spines.

Except for the presence of spines, the smaller parasites in Group II correspond closely to Ward's description of *F. rathouisi* but not to Poirier's original account upon which the species was founded. It is recognized that Poirier's report was incomplete and based upon a single poorly mounted specimen which so careful an investigator as Odhner has identified as a contracted form of *F. buski*. *F. rathouisi* as described by Ward is, according to his own account, very similar to his *F. goddardi*. Jeffries and others do not consider the distinction substantiated. Through the kindness of Dr. Ward it has been possible to examine a cleared and mounted co-type specimen of *F. goddardi*. This specimen was secured from the same locality as the flukes we have described. It measures 24 by 11.5 mm. The ventral sucker is 3.2 mm. in length, by 2.5 in width. The acetabular disc measures 1.6 by 1.0 mm. The oral sucker is 0.6 by 0.47 mm., with an aperture 0.3 by 0.18 mm. The cirrus is not conspicuous. The cæca are irregularly curved, show constrictions and dilatations and measure from 0.16 to 0.20 mm. in diameter. The surface shows evidences of disintegration and no cuticular spines could be demonstrated. In structure *F. goddardi* resembles the parasites of Group II. The spined flukes which we have described occasionally present slight variations in the branching of the testes, in the size of the vitelline acini and in the distention of the uterine coils. These variations are inconstant and may be due to different phases of functional activity. In general the specimens exhibit such morphological unformity that a further subdivision does not, at this time, seem justifiable.

That there are, however, spined and non-spined fasciolopsinæ in China is indicated by Jeffries who in 1911 stated that "the South China variety has cuticular spines on the anterior part of the body and is a more fleshy fluke than the specimens from Mid-China, in which, too, the spines are absent." The existence of a spined and a non-spined species is also suggested by the conflicting reports as to the presence of spines on *F. buski*, depending largely upon the locality from which the specimens have been secured, and by the finding of spines on alleged species closely allied to *F. buski*. That Group II is not *F. buski* is evident from the statement in the original description, and in subsequent reports by Looss, Stiles, and Odhner, that the cuticle of *F. buski* is smooth, and by other less conspicuous variations in form and structure. *F. fülleborni* is described as a non-spined fluke differing in this and other respects from the spined group. That it is not *F. rathouisi* is evident from the specific statement by Poirier that the fluke described by him does not possess cuticular spines and by the absence of any reference to such structures in the later description by Ward. Odhner has moreover re-examined the type specimen and believes it identical with *F. buski*. That the spined species may be *F. goddardi* is suggested by the close morphological resemblance and by Leiper's statement that *F. goddardi* is spined. Against this view is the original report by Ward in which cuticular spines are not mentioned and our failure to demonstrate these structures upon re-examination of a co-type specimen. Under these conditions it is difficult to identify Group II with any described species and inasmuch as the spinous character is so distinctive a feature of this group, it is presented as a separate species appropriately designated *Fasciolopsis spinifera*, in which may be included the flukes described as *F. buski*, or one of the allied species, which differ from the standard type in the possession of cuticular spines. Should further examination of the original type specimens satisfactorily establish their identity with Group II, the older designation may be employed and the proposed term be regarded only as a descriptive synonym.

In reporting this investigation the purpose is not to complicate further the classification by adding another species, but rather to present these two groups of parasites from the Orient in the hope that this and future studies may lead to a more satisfactory classification and to a better knowledge of the fasciolopsinæ. It is a pleasure to express my appreciation of the many courtesies received from the staff of the Johns Hopkins Hospital and to acknowledge my indebtedness to Dr. Charles W. Stiles of the United States Public Health Service, for his painstaking examination of the material upon which this report is based and for his valuable assistance in questions of classification and nomenclature.

CONCLUSIONS.

The species *Fasciolopsis buski* is subject to variations in size and form and in the relative prominence of internal structures depending on its maturity, its enviroment and perhaps upon the phase of sexual activity.

Closely related to *Fasciolopsis buski* is a distinct species represented here by Group II, the chief characteristic of which is the possession of cuticular spines. For this species the name *Fasciolopsis spinifera* is proposed.

TABULATED SYNOPSIS

Fasciolopsis buski. Fasciolopsis fülleborni. Fasciolopsis rathouisi.

Name.	Described by.	Size.	Shape.	Cuticular spines.	Ventral sucker.	Oral sucker.	Pharynx.
D. buski. *D. crassum.* *F. buski.*	Lankester, 1857. Cobbold, 1859. Looss, 1899. Stiles, 1901. Odhner, 1902.	Length, 24-45 mm. Width, 6-12 mm. Thickness, 1.5-4 mm. Also, Length, 24-70 mm. Width, 5.5-14 mm.	Elongated, nearly oval. Indefinite cephalic cone.	Absent.	Diameter 1.6 to 2 mm.	Subterminal. Diam. 0.5 mm.	Globular. Diam. 0.7 mm.
F. fülleborni.	Rodenwaldt, 1909.	Length, 30-50 mm. Width, 14-16 mm. Usually, 50 by 14 mm.	Tongue-shaped. Cephalic cone not clearly defined.	Absent.	2.6 by 2.9 mm.	Circular. Subterminal. Diam. 0.75 mm.	Diam. 0.7 mm.
F. of Group I. (*F. buski.*)		Length, 21-48 mm. Width, 7-15 mm. Thickness, 1.5-3.3 mm. Average of mature worms: Length, 36.7 mm. Width, 11.2 mm. Thickness, 2.1 mm.	Elongated, irregularly oval, tongue-shaped. Short, blunt cephalic cone not well defined.	Absent.	Length, 2.65-3.0 mm. Width, 1.95-2.6 mm. Average, 2.86 x 2.24 mm. Acetabular Disc. 1.15 to 1.6 by 0.7 to 1.2 mm. Average, 1.4 x 0.95 mm.	Subterminal, 0.5 x 0.3 to 0.6 x 0.35 mm. Oral aperture, Diam. 0.2-0.4 mm. Aver. 0.31 mm.	Globular, somewhat flattened. 0.6 to 0.9 by 0.5 to 0.65 mm. Average, 0.7 x 0.57 mm.
D. rathouisi. *F. rathouisi.*	Poirier, 1887. Ward, 1903.	Length, 15-19 mm. Width, 8.5-10.5 mm. Thickness, 3 mm. (Ward.) 25 x 16 mm. (Piorier)	Bluntly oval or elliptical with short cephalic cone.	Absent. (Poirier, Ward.) Present. (Leiper.)	1.32 to 1.38 by 0.68 to 0.7 mm.	Subterminal, 0.25 to 0.29 by 0.2 mm.	
F. goddardi.	Ward, 1909.	Length, 21-22 mm. Width, 9 mm.	Oval. Longer and more slender than *F. rathouisi.*	Absent. (Ward.) Present. (Leiper.)		Smaller than in *F. buski* or *F. rathouisi.*	
F. of Group II. (*F. spinifera.*)		Length, 17-30 mm. Width, 7.5-13 mm. Thickness, 2.3-3.5 mm. Average of mature worms: Length, 25.4 mm. Width, 11.4 mm. Thickness, 2.6 mm.	Oval. Stocky. More fleshy than *F. buski.* Cephalic cone small but well defined on lateral inspection.	Present on ventral surface and margins. Most numerous on anterior third.	Length, 2.75-3.2 mm. Width, 2.1-2.7 mm. Average, 3.01 x 2.34 mm. Acetabular Disc. 1.45 to 1.70 by 0.70 to 1.05 mm. Average, 1.60 x 0.88 mm.	Subterminal. Average size, 0.58 x 0.35 mm. Oral aperture, Diam. 0.32 mm.	Globular, flattened. 0.82 x 0.65 mm. Lumen, 0.22 mm.

OF CHARACTERISTICS.

Fasciolopsis goddardi. Group I, *F. buski.* Group II, *F. spinifera.*

Cæca.	Cirrus pouch.	Vitellaria.	Shell-gland.	Testes.	Uterus.	Excretory vesicle.	Ova.
Lateral, unbranched, with two characteristic curves toward the median line.	Conspicuous, straight, cylindrical sac, .25 to .33 mm. in diameter. Extends half way to shell-gland. Contains seminal vesicle and peculiar cæcal appendage.	Marginal. Acini small and numerous.	Round. Diameter, 1.0 to 1.5 mm. Located about middle of body.	Dendritic. Posterior to shell-gland, one behind the other in median line.	Large open coils. Anterior to shell-gland.	Tubular. Excretory pore at posterior extremity.	Thin-shelled. Operculated. .120 to .130 by .077 to .080 mm.
As in *F. buski.*	Prominent, convoluted sac, diameter, 1 mm. Extends two-thirds of distance to shell-gland. Contains convoluted, saccular seminal vesicle. No cæcal appendage observed.	Similar to *F. buski* in distribution. Acini strikingly small.	Almond-shaped. 2.3 x 1.2 mm.	Regularly branched. Separated by incurving cæca. Anterior smaller than posterior.	As in *F. buski.* Large distended coils.	Median stem with transverse branches. Caudal foramen.	Thin-shelled. Operculated. Length, .100 Width, .073
Lateral, unbranched, with two regular curves as in *F. buski.* Diameter uniform, measures from 0.25 to 0.45 mm. Average diameter, 0.36 mm.	Conspicuous, convoluted sac. Extends half to two-thirds distance to shell-gland. Contains seminal vesicle and large diverticulum. Cirrus frequently protrudes. Convoluted portion is from 0.55 to 1.30 mm. in diameter.	Marginal. Acini small and numerous; vary in diameter from 0.05 to 0.12 mm.	Oval. Located in anterior part of middle third. Measures, 1.35 to 1.80 by 1.00 to 1.45 mm. Average, 1.6 x 1.3 mm.	Extensive ramifications. Conspicuous transverse axes. Irregular saculations in old worms.	Large coils, densely packed with ova. Maximum diameter 0.4 to 0.8 mm.	Median canal dividing near shell-gland. Numerous tributary branches. Caudal foramen on dorsal surface near posterior extremity.	Thin-shelled. Operculated. Length, .120–.138 mm. Width, .072–.094 mm. Opere., .027–.035 mm. Average, Length, .128 mm. Width, .084 mm. Operculum, .031 mm.
More irregular than in *F. buski* and with more pronounced curves.	Convoluted. Not so conspicuous as in *F. buski.*	Distribution slightly different from *F. buski.* Acini more numerous.		More compactly branched, broader and denser than in *F. buski.*	Broad, heavy, closely grouped coils.		Oval, thin-shelled, with delicate operculum. Length, .150 mm. Width, .080 mm.
		Acini larger and more conspicuous than in *F. buski.*			Very closely coiled.		
Curves pronounced and frequent. Irregularly looped. Numerous constrictions and dilatations. Diameter small, 0.16 to 0.23 mm. Average, 0.20 mm.	Convoluted sac as in Group I, but smaller and not so prominent. Diverticulum present. Cirrus seldom protrudes. Convoluted portion is from 0.4 to 0.6 mm. in diameter.	Acini slightly larger than in Group I, measuring in diameter from 0.07 to 0.16 mm.	Oval. Longer and narrower than in Group I. Measures, 1.6 to 2.2 by 1.0 to 1.3 mm. Average, 1.9 x 1.1 mm.	Ramifications more numerous and denser than in Group I.	More tightly coiled than in Group I. Lumen smaller. Diameter does not exceed 0.45 mm.	Median canal with tributary branches. Caudal foramen on dorsal surface near posterior extremity.	Thin-shelled with small, delicate operculum. Length, .130–.160 mm. Width, .070–.095 mm. Opere., .016–.032 mm. Average, Length, .138 mm. Width, .082 mm. Operculum, .023 mm.

It may be desirable to simplify the present classification and group the species of Fasciolopsis heretofore described into these two species distinguished by the presence or absence of cuticular spines.

REFERENCES.

Fasciolopsis buski, rathouisi, goddardi and *fülleborni.*

Barrois, Th., et Noc, F. (1908): Sur la fréquence du *F. buski* en Cochinchine. Bull. Soc. pathol. exot., Paris, I, pp. 216-221.

Brau, P. (1912): Parasitisme intestinal du porc de Cochinchine. Bull. Soc. méd.-chir. de l'Indo-Chine, Hanoi et Haifong, III, pp. 585-587.

Castellani and Chalmers (1915): Man. of Trop. Med., pp. 472, 473.

Cobbold, T. S. (1860): Synopsis of the Distomidæ. Jour. Proc. Linnean Soc., London, I, p. 1.

Idem (1875): On the Supposed Rarity of *Distomum crassum*. Jour. Proc. Linnean Soc., London, XII, p. 285.

Idem (1879): Parasites: A Treatise on the Entozoa of Man and Animals. London.

Goddard, F. W. (1907): Two Rare Fasciolidæ. China Medical Journal, XXI, pp. 195-198.

Heanley, C. M. (1908): A Large Fluke of Man Probably not Hitherto Described. *F. buski* as a Parasite of Man in Hongkong; its usual host probably the pig. Jour. Trop. Med. & Hyg., XI, pp. 122, 123.

Jeffries, W. H. (1910): Diseases of China, Jeffries and Maxwell, pp. 183-188.

Lankester, E. R. (1857): Manual of Animal and Vegetable Parasites, Appendix B, p. 437.

Leiper, R. T. (1911): On Kwan's Fluke and the Presence of Spines in Fasciolopsis. Jour. Trop. Med. & Hyg., XIV, pp. 119, 120.

Looss, A. (1899): Weitere Beiträge zur Kenntnis der Trematoden-Fauna Aegyptens, zugleich Versuch einer maturlichen Gliederung des Genus *Distomum retzius.* Zool. Jahrb. Syst., XII, pp. 521-784.

Idem (1907): Some Parasites in the Museum of the School of Tropical Medicine, Liverpool. An. Trop. Med. & Par., I, pp. 123-152.

Idem (1914): Handbuch der Tropenkrankheiten, Carl Mense. Vol. II, pp. 375, 376.

Lyngdoh, H. (1906): *Distomum crassum*. Indian Med. Gaz., Calcutta, XLI, pp. 405, 406.

Mathis, C., et Leger, M. (1911): *F. buski* au Tonkin, Son extrême rareté chez l'homme; sa fréquence chez le porc. Bull. Soc. pathol. exot., Paris, IV, pp. 200-202.

Idem (1911): Recherches de Parasitologie et de Pathologie, humaine et animale, au Tonkin., pp. 188-190.

Maxwell, J. L. (1911): Research Report. China Med. Jour., Shanghai, Jan., pp. 166-173.

Moore, J. T., and Terrill, J. J. (1905): *Fasciolopsis buski:* the first case reported in the United States; found in a patient dying of typhoid fever. Jour. Am. Med. Assn., XLV, pp. 1002-1003.

Nicol, B. (1910): *Fasciolopsis buski* in Natal. Jour. Trop. Med. and Hyg., XIII (Nov. 15), p. 341.

Odhner, Th. (1902): *Fasciolopsis buski*, ein bisher wenig bekannter Parasit des Menschen in Ostasien. Cent. Bakt. u. Par. Jena, XXXI, pp. 573-581.

Idem (1908): Was ist *Distomum rathouisi?* Arch. Parasitol. XII, pp. 467-471.

Poirier, P. (1887): Note sur une nouvelle espèce de Distome, parasite de l'homme, le *Distomum rathouisi*. Arch. zool. exp. géner. (2), V, p. 203.

Rodenwaldt, E. (1909): *Fasciolopsis fülleborni*. Centrbl. Bakt., Parasit. u. Infect., Jena, L, pp. 451-461.

Idem (1909): Ein neuer Trematode, *Fasciolopsis fülleborni*. Verh. Deutsch. tropen-med. Ges., Arch. Schiffs. u. Trepenhyg., XIII, p. 305.

Stephens, J. W. W. (1916): Animal Parasites of Man (after Braun). Fathan, Stephens, and Theobald, pp. 245-249.

Stiles, C. W. (1901): Illustrated Key to the Trematode Parasites of Man.

Ward, H. B. (1903): Trematoda. Wood's Ref. Handb. Med. Sciences, VII, pp. 859-874.

Idem (1908): Data for the Determination of Human Entozoa, II. (Studies from the Zool. Lab., Univ. of Nebraska, No. 86.) Trans. Amer. Micr. Soc., XXVIII, pp. 177-202.

Idem (1909): *F. buski, F. rathouisi* and Related Species in China. (Studies from the Zool. Lab., Univ. of Nebraska, No. 94.) China Medical Journal, XXIV (Jan., 1910), pp. 1-10.

DESCRIPTION OF FIGURES.

Fig. 1.—*F. buski.* Unspined fasciolopsinæ from Group I. Actual size. Ventral surface.

Fig. 2.—*F. spinifera.* Spined fasciolopsinæ from Group II. Actual size. Ventral surface.

Figs. 3, 4 and 5.—*F. buski.* Unspined fasciolopsinæ from Group I, stained, cleared and photographed with transmitted light. Twice actual size. No. 3 is the dorsal view of a small specimen. The shell-gland is centrally located and almost spherical. Nos. 4 and 5 represent mature flukes of this group, showing the oval shell-gland, the cæca with typical curves, the convoluted cirrus pouch and the protruding cirrus. No. 4 is a dorsal view and shows the caudal foramen and the excretory canal bifurcating near the shell-gland. Portions of the excretory sinus have retained the hæmatoxylin stain. In No. 5 the ventral surface is uppermost. In all three specimens the vitellaria intermingle near the posterior extremity.

Figs. 6, 7 and 8.—*F. spinifera.* Spined fasciolopsinæ from Group II. Twice actual size. Figs. 6 and 7 are stained and mounted with the ventral surface uppermost. They show irregularly convoluted cæca of relatively small diameter. The shell-gland is oval. Ramifications of the testes are denser and coarser than in Figs. 3, 4 and 5. Fig. 8 is from an unstained specimen and shows the excretory system consisting of a median canal with numerous tributary branches.

Fig. 9.—*F. spinifera.* Marginal spines from a mounted specimen of Group II. (From specimen shown in Fig. 7.) × 125.

Fig. 10.—*F. spinifera.* Cuticular spines on ventral surface at level of acetabulum. From sagital section of specimen from Group II. Hæm. & Eosin. × 250.

Fig. 11.—*F. spinifera.* Cuticular spines on ventral surface between acetabulum and shell-gland. Transverse section of specimen from Group II. Hæm. & Eosin. × 250.

Fig. 12.—*F. spinifera.* Dorsal cuticle. Transverse section of specimen from Group II. Hæm. & Eosin. × 250.

Fig. 13.—*F. spinifera.* Cuticular spines on ventral surface of fluke from Group II. Masses of vitelline acini are seen through the cuticle. Unstained. × 30.

Fig. 14.—*F. spinifera.* Ventral surface of fluke from Group II showing scale-like character of cuticular spine. Unstained. × 125.

Fig. 15.—*F. buski.* Oval shell-gland and branched ovary from an unspined fluke of Group I. (Fig. 5.) Uterine coils are seen above and ramifications of the testes below. × 15.

Fig. 16.—*F. buski.* Foramen caudale, showing annular striations and caudal fissure. × 75.

Fig. 17.—*F. buski.* Convoluted cirrus pouch from an unspined fluke (Fig. 4.) Dorsal view. Cirrus is deeply stained. Faintly stained structure parallel with, and to the left of, the cirrus is the metraterm. Cæcum at extreme left. Posterior portion of the pouch is obscured by distended uterine coils. × 14.

FIG. 1.

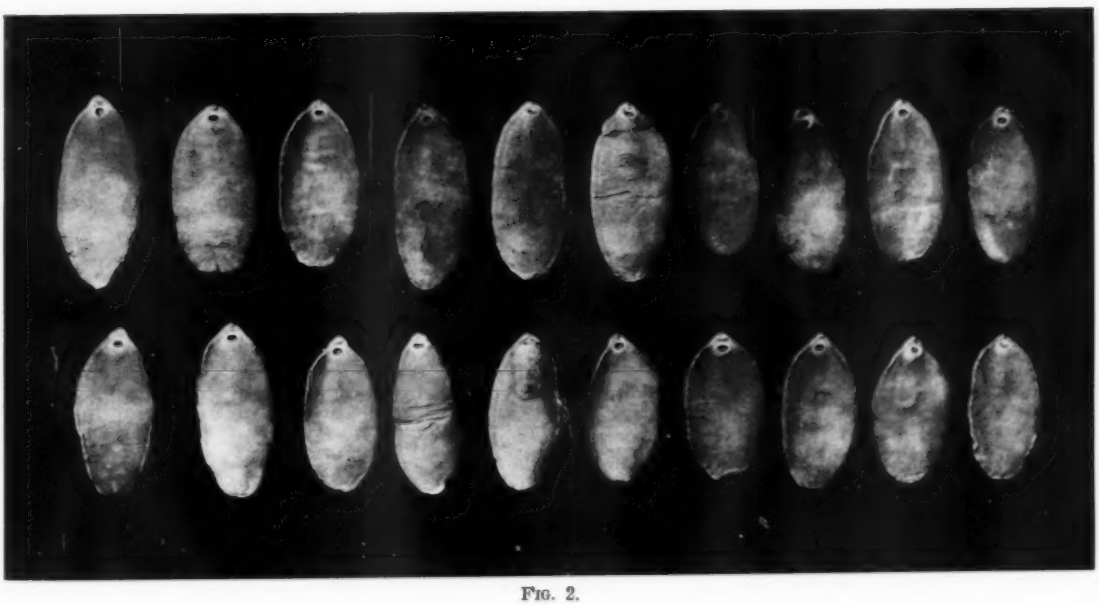


FIG. 2.

FIG. 3.

FIG. 4.

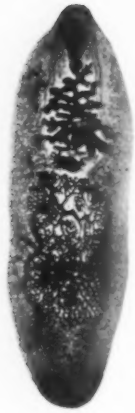


FIG. 5.

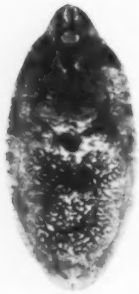


FIG. 6.

FIG. 7.

FIG. 8.

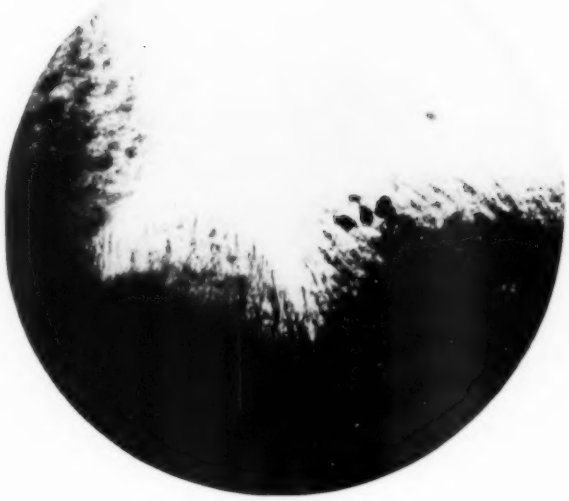


FIG. 9.

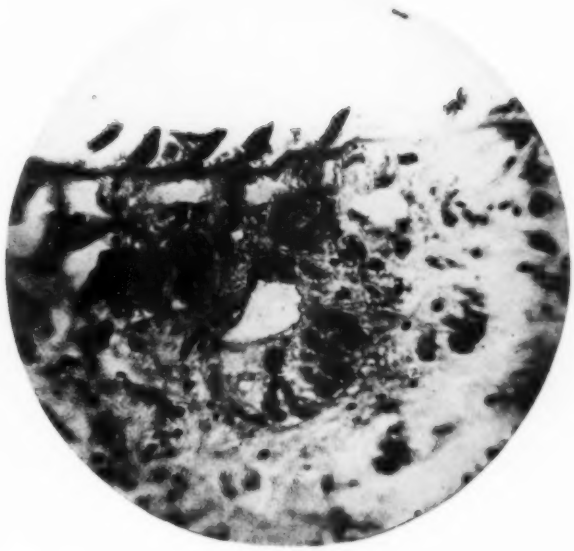


FIG. 10.

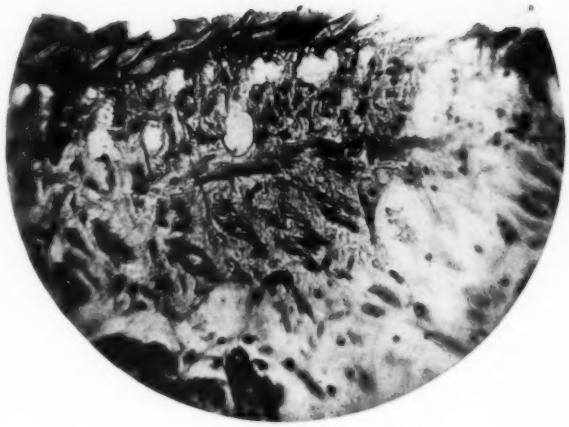


FIG. 11.

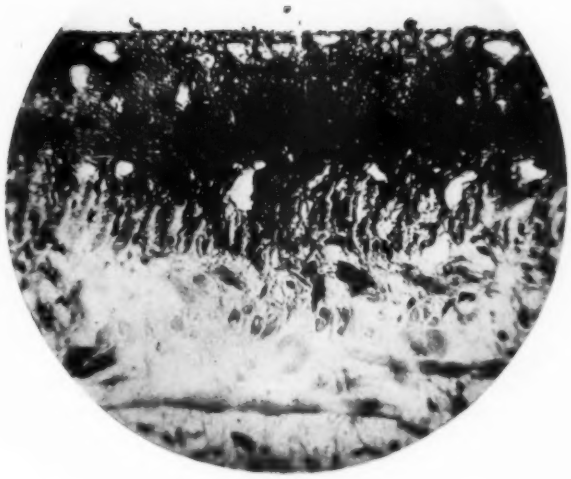


FIG. 12.

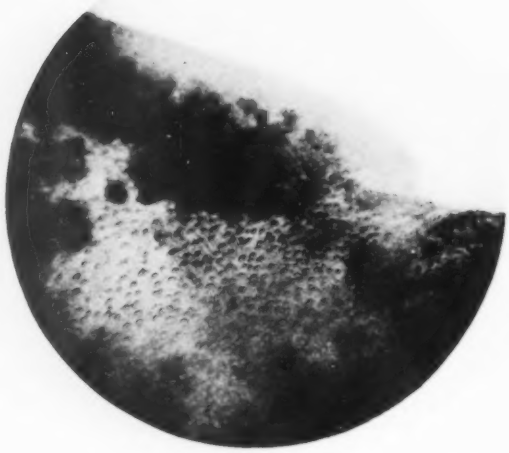


FIG. 13.

FIG. 14.

FIG. 15.

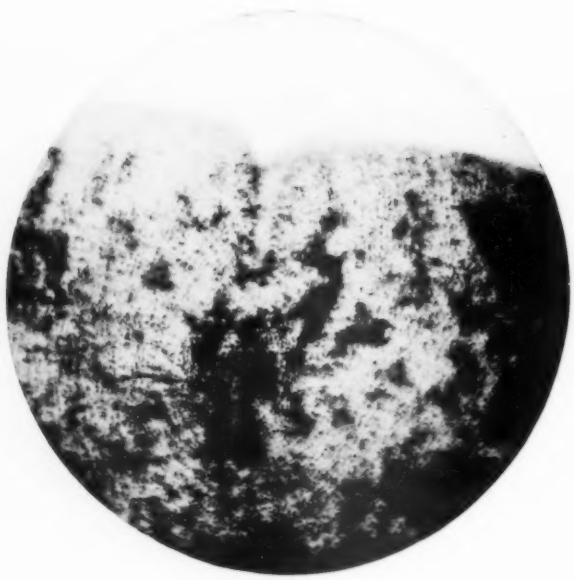


FIG. 16.

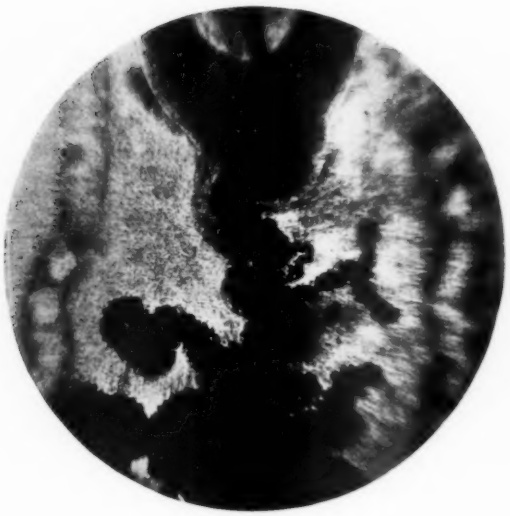


FIG. 17.

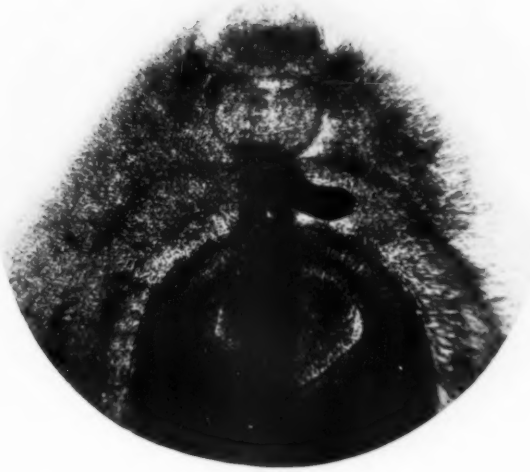


FIG. 18.

FIG. 19.

FIG. 20.

FIG. 21.

FIG. 22.

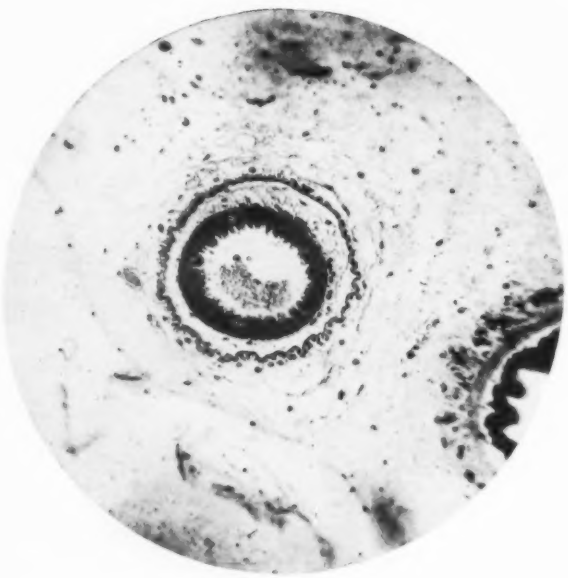


FIG. 23.

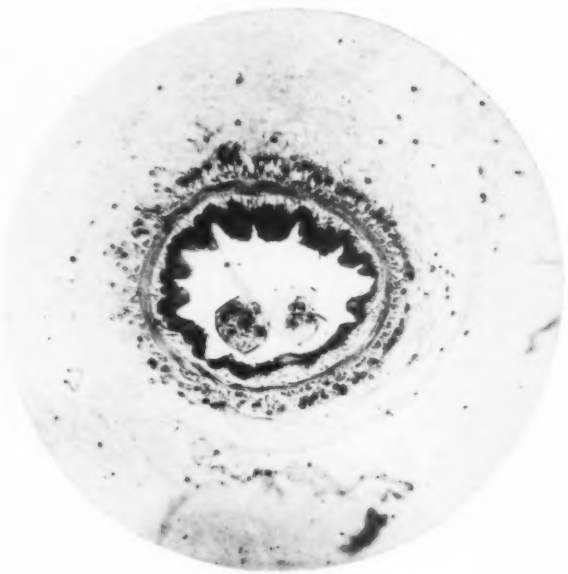


FIG. 24.

FIG. 25.

FIG. 26.

FIG. 27.

FIG. 28.

FIG. 29.

FIG. 30.

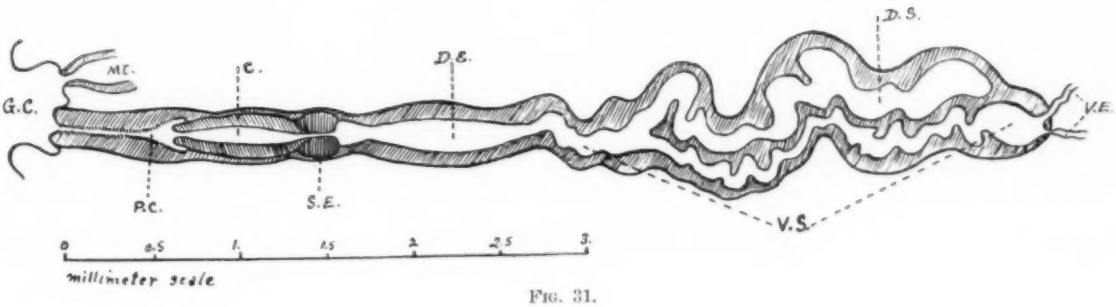


FIG. 31.

FIG. 18.—*F. buski.* Anterior extremity of an unspined fluke (Fig. 5). Ventral view. Structures from above downward are: oral sucker, globular pharynx, cirrus protruding through genital pore and the acetabulum through which can be seen the metraterm and the ejaculatory duct. The cæca appear curving around the acetabulum and meeting just behind the pharynx. × 20.

FIG. 19.—*F. spinifera.* Free-hand sagital section through anterior portion of a fluke from Group II, showing the convolutions of the cirrus pouch. × 14.

FIG. 20.—*F. buski.* Free-hand sagital section through the cephalic cone of an unspined fluke. Structures from right to left are: oral sucker, prepharynx, pharynx, transverse section of cæcum, ejaculatory duct and the anterior lip of the ventral sucker. The cirrus projects through a partially everted genital pore. × 30.

FIG. 21.—*F. spinifera.* Horizontal section through the posterior portion of the cirrus pouch showing the convoluted seminal vesicle and its diverticulum in cross-section. Near the lower edge of the section the vasa efferentia may be seen entering the cirrus pouch. Hæm. & Eosin. × 30.

FIG. 22.—*F. spinifera.* Cross-section of the seminal diverticulum from the same section as Fig. 21, but under higher magnification. Within its lumen are large numbers of spermatozoa. Hæm. & Eosin. × 160.

FIG. 23.—*F. spinifera.* Cross-section of the ejaculatory duct at the level of the acetabular disc. Hæm. & Eosin. × 160.

FIG. 24.—*F. spinifera.* Cross-section of the metraterm from same section as Fig. 23. Hæm. & Eosin. × 160.

FIGS. 25, 26 and 27.—*F. buski.* Typical ova from flukes of Group I.

FIG. 25.—Length, 0.118 mm. Width, 0.082 mm. Operculum, 0.030 mm.

FIG. 26.—Length, 0.118 mm. Width, 0.078 mm. Operculum, 0.030 mm.

FIG. 27.—Length, 0.124 mm. Width, 0.086 mm. Operculum, 0.028 mm.

FIGS. 28, 29 and 30.—*F. spinifera.* Typical ova from flukes of Group II.

FIG. 28.—Length, 0.132 mm. Width, 0.076 mm. Operculum, 0.020 mm.

FIG. 29.—Length, 0.140 mm. Width, 0.078 mm. Operculum, 0.018 mm.

FIG. 30.—Length, 0.144 mm. Width, 0.070 mm. Operculum, 0.018 mm.

FIG. 31.—Composite outline of structures within the cirrus pouch. From camera lucida drawings.

V. E. Vasa efferentia.
V. S. Seminal vesicle, 2.5 to 4.0 mm.
D. S. Seminal diverticulum, 2.0 to 3.0 mm.
D. E. Ejaculatory duct, 1.2 to 1.5 mm.
S. E. Ejaculatory sphincter, 0.3 mm.
C. Cirrus proper, 0.6 to 0.9 mm.
P. C. Pre-cirral canal, 0.6 to 1.0 mm.
G. C. Genital cloaca.
Mt. Metraterm.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

MARCH 5, 1917.

1. **Exhibition of Case of Cerebro-Spinal Meningitis.** DR. V. P. W. SYDENSTRICKER.

C. T., white, aged 21 years, laborer, entered the hospital on January 25, 1917, complaining of sore throat, headache and general malaise. The family history was negative with reference to the present illness. The patient has been blind in his left eye since birth.

His present illness began 24 hours before admission with a slight sore throat and headache. The headache increased rapidly in severity and was accompanied by a marked prostration. Eight hours before admission the patient began to have violent nausea with vomiting, accompanied by some pain at the back of his neck and in all the back muscles.

On admission the temperature was 102.4°, the pulse 188, respirations 30. The patient was semi-delirious, lying in bed with his head retracted, the thighs and legs flexed. He was restless, moaned constantly and complained of pain in the back of the neck. Scattered over the shoulders, thorax, abdomen and legs were numerous bright red petechial spots, varying in size from a pin-head to a dime. There was marked tenderness over the occipital region and neck. The neck was completely rigid. The right pupil was dilated. There was marked photophobia, and a moderate amount of conjunctival injection. The E. O. movements were normal. The conjunctiva of the left eye was markedly injected. There was a subconjunctival hæmorrhage. The left cornea was entirely opaque. The lips were covered with sordes. The mouth was foul, the tongue heavily coated. The tonsils and pharynx were injected. The lungs and heart were negative. The abdomen was negative except for a large, soft spleen. The hands and arms showed a coarse tremor. All the deep reflexes were slightly increased. The Kernig and Brudzinski's signs were positive. W. B. C. 21,000.

A lumbar puncture, on admission, gave a turbid, almost purulent fluid. Twenty cubic centimeters of antimeningococcus serum were injected. Smears from this spinal fluid showed many gram-negative, biscuit-shaped diplococci, both intracellular and extracellular. Cultures gave many colonies of the meningococcus.

Lumbar puncture was repeated at 10.30 a. m. on the next day (January 26). Twenty cubic centimeters of serum were injected. During the day the symptoms increased in severity. The pulse fell to 60 per minute, the respirations to 14 per minute. There was definite choking of the right optic disc.

Lumbar puncture was repeated at 5 p. m. Only 10 c. c. of fluid could be obtained. It seemed clear that there was an obstruction to the descent of the cerebro-spinal fluid probably from massive exudate at the base of the brain.

At midnight Dr. Dandy trephined the cranium in the right fronto-parietal region and punctured the right lateral ventricle. There was an immediate escape of a large amount of turbid fluid under high pressure. The operation was done under primary ether anæsthesia. Immediately after the ventricular puncture the pulse and respirations increased in rapidity.

January 27.—No marked change in patient's symptoms. Lumbar puncture at 10 a. m. and 10 p. m. Forty cubic centimeters of antimeningococcus serum were injected each time. At 5 p. m. 60 c. c. of antimeningococcus serum given intravenously.

January 28.—Lumbar puncture at 10 a. m. Forty cubic centimeters of serum were injected. Ventricular puncture was repeated at 10 p. m. One cubic centimeter of phenosulphonephthalein was injected intraventricularly in 40 c. c. of serum. Thirty minutes later lumbar puncture was done. A large amount of phthalein was recovered. Sixty cubic centimeters of serum were injected intraspinally.

January 29.—Marked symptomatic improvement. Lumbar puncture gives an almost clear fluid. Forty cubic centimeters of serum were injected. The cerebro-spinal fluid was sterile for the first time on this day.

Lumbar puncture was performed three times subsequently, on January 31, February 2, and February 5. Each time 40 c. c. of serum were injected. The patient showed marked and rapid improvement. On February 5, a marked left facial paralysis appeared and persisted for 10 days. Convalescence was complicated by an acute tonsillitis which appeared on February 9 and lasted six days, and by a typical serum sickness with urticaria and joint pain which appeared on February 16 and lasted three days. The patient was discharged from the hospital on March 17, well. He received a total of 470 c. c. of antimeningococcus serum of which 60 c. c. were given intravenously, 40 c. c. intraventricularly and 370 c. c. intraspinously.

2. (a) Absorption of Drugs Through the Eye. (Abstract.) Dr. D. I. Macht.

While a large number of drugs are used in eye practice, but few cases of constitutional symptoms due to their systematic absorption are on record, so that some authorities claim that those cases in which systematic symptoms have occurred are to be ascribed to the careless handling of the drugs and their accidental absorption through the mouth. Cases of atropin and cocain poisoning, however, have been described in which no such explanation is warranted. The following experiments by the author seem to prove conclusively that drugs may be absorbed after instillation into the conjunctival sac more easily than is commonly supposed.

If a few milligrams of apomorphin hydrochloride or a few drops of apomorphin HCl solution (1 per cent) are introduced into the conjunctival sac of a dog, vomiting promptly takes place in one or two minutes. In such an experiment absorption through the mouth by licking is excluded by the experimenter holding the animal still. Inasmuch as dogs react to morphin by vomiting almost as quickly as to apomorphin, exactly the same results were obtained by introducing morphin into the eye. Morphin and apomorphin are emetics which have been proved to exert their effect through a central action on the vomiting center in the medulla. The above experiments, therefore, indicate that these drugs are absorbed through the eye or its appendages. Inasmuch as in addition to the lachrymal apparatus, the vascular and lymph supply of the eye are very highly developed, the author is inclined to believe that absorption takes place not only through the lachrymal and nasal ducts, but also by direct absorption through the blood and lymph.

2. (b) Truth and Poetry Concerning Hydrastis. (Abstract.) Dr. D. I. Macht.

Hydrastis or golden seal and its alkaloids, hydrastin and hydrastinin, are used interchangeably by medical men for various conditions, especially in the fields of urology and gynecology. Two chief claims have been urged in favor of the crude drug and its alkaloids. On the one hand it has been recommended as a uterine and vesical styptic, and on the other hand as a uterine and vesical sedative. As the action of hydrastis has never been carefully analyzed, the author investigated the pharmacological effects of its principal derivatives, namely, the alkaloids berberin, hydrastin and hydrastinin. It was found that berberin has little physiological effect except when used in very large doses, when it tends to inhibit the contractions of smooth muscle. The effects of hydrastin and hydrastinin were found to be diametrically antagonistic to each other in exactly the same way as those of the opium alkaloids, narcotin and cotarnin, to which they are very closely related chemically. Hydrastinin acts as a stimulant to the smooth muscle of the uterus, urinary bladder and gall-bladder, intestine, vas deferens, bile ducts and blood vessels (isolated and perfused). Hydrastin, on the other hand, inhibits the contractions and relaxes the tonus of all the above-mentioned organs. In tincture hydrastis (alcohol having been removed) the hydrastin effect generally prevails. From the above experiments it is evident that the sedative effects of hydrastis are chiefly due to hydrastin, whereas the styptic effects of the contractions of blood vessels and the uterus can only be produced by hydrastinin. By choosing the proper alkaloid instead of using the crude drug, the desired therapeutic effect can be produced at the choice of the experimenter.

3. Subacute Streptococcus Endocarditis in the Bacterial and Bacteria-Free Stages. Dr. E. Libman, New York City.

MARCH 19, 1917.

1. The Growth of Bacillus Coli in Urine at Varying Hydrogen-ion Concentration. (Abstract.) Dr. A. T. Shohl and Mr. J. H. Janney.

The study was undertaken to determine the effects of accurately measured increases in the acidity and alkalinity on the growth of *B. coli*. As the purpose was to apply ultimately the findings to a study of pyelitis the experiments were done on urine. This was titrated to the desired H-ion concentration by means of colored standards. The standards were phthalates, phosphates and borates; the indicators were methyl red, and the sulphonephthalein indicators. The range covered was from pH 4.0 to pH 9.6. The number of organisms were estimated by diluting and plating on agar and counting the number of colonies. Series were made from the start up to 12 hours.

The results of seven organisms show that *B. coli* has an optimal growth at pH 6.0 to pH 7.0. The acid inhibition point is pH 4.6 to pH 5.0. The alkaline inhibition point is pH 9.2 to pH 9.6.

Typhoid bacilli (Rawlings), streptococci and staphylococci were also used.

2. Acidosis. Dr. L. J. Henderson, Harvard University.

MAY 7, 1917.

1. A Summary of End-Results in the Treatment of Cases of Pelvic Abscess by Vaginal Incision and Drainage. Dr. Lawrence Wharton.

2. Observation on the Degeneration of Leucocytes in the Urine as a Diagnostic Aid in Tuberculosis of the Urinary Tract in Women. Dr. H. M. N. Wynne.

Published in the Bulletin for August, 1917.

3. Treatment of Leucorrhœa. Dr. H. N. Shaw.

4. A Case of Saphenous Varix Simulating a Femoral Hernia. Dr. E. H. Richardson.

The following case illustrates a condition which appears to enjoy the distinction of having usually led the modern clinical surgeon into diagnostic error. At least, the reported cases, with few exceptions, are confessions of mistaken identity. This one was an arch-offender, having misled and humiliated in succession at least five learned and distinguished surgeons.

Mrs. R. M., white, age 38 years, was admitted to the gynecological department of The Johns Hopkins Hospital on March 4, 1917, complaining of certain symptoms referable to her pelvic organs and of a swelling in the right groin. She had previously undergone two major operations; one four years ago for radical cure of a right femoral hernia and appendectomy, and one in January of this year for a right oblique inguinal hernia. Unfortunately, however, after both operations, when she had convalesced sufficiently to get out of bed the pesky lump promptly reappeared in the right groin. I first saw her on March 7, 1917, a few weeks following her discharge from the hospital after the second operation. The examination disclosed a swelling the size of a hen's egg directly over the femoral canal, which promptly and

completely disappeared in the recumbent posture. A definite impulse and bulging were demonstrable when the patient coughed, but I was unable to recognize either a patent femoral canal or any palpable contents of a hernia sac. The situation of the swelling was particularly interesting in its relationship to the two operative scars, one of which was above Poupart's ligament and the other at least five centimeters below and parallel to it, while the lump appeared midway between them. I made my incision directly over the tumor, but instead of readily exposing a hernia sac, I encountered in the subcutaneous tissues of the groin just over the cribriform fascia and the femoral canal a small circumscribed mass of fatty tissue containing a few lymphatic glands and a plexus of much dilated veins. Both the external abdominal ring and the femoral canal were tightly closed and there were no signs of a hernia present. By withholding the anesthetic and permitting the patient to retch, we were able to positively exclude the existence of a hernia and to observe an enormous distension of the mass of veins. At its lower margin the internal saphenous vein was easily identified and it became obvious that we were dealing with a circumscribed varix of the upper portion of this vein together with its adjacent tributaries. The ligation and division of the trunk veins with excision of the mass of varices and fatty tissue was technically simple. It was interesting to note that there were no varicose veins lower down in the leg. At the time of her discharge from the hospital the patient was apparently cured.

A survey of the literature shows that circumscribed saphenous varix in the region of the femoral canal and external abdominal ring, while uncommon, nevertheless has long been recognized by surgeons as a condition to be differentiated from both inguinal and femoral herniæ. I have collected reports of 10 cases, the earliest being by a French observer, Boinet, in 1836. Seven of these were diagnosed prior to operation either as incarcerated or strangulated femoral hernia.

The condition closely resembles a femoral hernia not only in the size, shape and location of the tumor mass, but also in that it disappears on lying down and imparts a distinct impulse on coughing. The differential points are first, its unusual softness; second, a perceptible thrill which is imparted to the palpating finger when the patient coughs or if slight pressure be made over the mass while the blood escapes from the dilated veins when the patient first lies down; third, having reduced the tumor, if sufficient pressure is made over the femoral canal to prevent the escape of bowel or omentum, and the patient then be allowed to stand up, the tumor will be seen gradually to reform; and finally, the association of varicose veins lower down in the leg is frequent and is a helpful point in diagnosis.

LITERATURE.

1. Boinet. Gaz. méd. de Par., 1836, 2 s. IV, 829.
2. Camera, U. Policlin, Rom., 1912, XIX, 1273.
3. Coopernail, G. P. Med. Rec., 1914, LXXXV, 1167.
4. Dawbarn. Ann. Surg., 1900, XXXII, 297.
5. Brewer. *Ibid.*
6. Lucas-Championnière (J.). Assoc. franc. de chir., Paris, 1904, XVII, 662.
7. Noehren, A. H. Jour. Am. Med. Assn., 1910, LV, 2298.
8. Loos, O. Beitr. z. klin. chir., 1900, XXXVIII, 654.
9. Segond. Quoted by Loos.
10. Schwartz. Rev. gén. de. chir. et de thérap., Paris, 1915, XXIX, 197.

5. **Hematomata of the Ovary Including Corpus Luteum Cysts.** DR. EMIL NOVAK.

To appear later in the BULLETIN.

6. **Stricture of the Ureter. Report of 100 Cases.** DR. H. M. N. WYNNE.

To appear later in the BULLETIN.

MAY 21, 1917.

1. **Demonstration of a Simple Method for Determination of Venous Pressure.** DR. N. WORTH BROWN.

2. **Demonstration of Spontaneous Rhythmic Contraction of Arteries.** DR. H. B. RICHARDSON and DR. E. A. PARK.

3. **A Hitherto Undescribed Sporotrichum.** DR. W. R. SISSON.

4. **(a) Studies on Disturbances of Thyroid Function, with Special Reference to Thyroid Adenomata.**

4. **(b) Adrenalin Hypersensitiveness in Hyperthyroidism.** DR. EMIL GOETSCH.

THE JOHNS HOPKINS HOSPITAL HISTORICAL CLUB.

MARCH 12, 1917.

1. **Presentation of the Medallion Portrait of Dr. Rupert Norton. Presentation on Behalf of Mrs. Norton by Dr. W. S. Thayer. Acceptance for the Trustees of the Hospital by Hon. Henry D. Harlan. Closing Remarks by Dr. William H. Welch.**

Published in full in the BULLETIN for July, 1917.

2. **Johns Hopkins and Some of his Contemporaries.** DR. HENRY M. HURD.

Published in full in the BULLETIN for July, 1917.

3. **Giovanni Maria Lancisi: Clinician, Pathologist, Epidemiologist.** (Abstract.) DR. JOHN FOOTE, Washington, D. C.

Giovanni Maria Lancisi was born in Rome in 1654, of middle class parents, who seemed ambitious for their son's career. Giovanni took the usual college course, pr paring at first to study theology but later turning to the medical branches. He graduated at the Collegio de Sapienza in 1672 with the degree of doctor. He became an assistant physician at the Santo Spirito Hospital and later accepted a canonship at the church of San Salvatore College, where he studied and taught for five years. He became professor of anatomy in the Collegio de Sapienza in 1684 and taught anatomy for 13 years, becoming at the end of that time professor of the theory and practice of medicine.

While he attended the two preceding popes, he is remembered among the papal physicians especially as the friend and private physician of Clement XI. This pope was of great assistance to Lancisi in his public health work and in financing his various literary undertakings and his teaching.

Lancisi amassed a library of 30,000 volumes which he bequeathed to the Santo Spirito Hospital. This is the first public medical library of which we have any record, excepting some collections of medical books in general libraries. Lancisi died January 31, 1730.

Lancisi was an anatomist, a pathologist, an epidemiologist and a clinician. He was far in advance of his time in his attitude towards questions of public health. He was probably the pioneer European forest conservationist. Unlike many other reformers he did not die in obscurity and unrecognized. He was the friend and correspondent of most of the famous men of his day. He had a singularly useful and happy life, having the time and means to do the work which he loved.

He published and edited the wonderful anatomical plates of Eustachius, which had lain for a century in the Vatican library. In his medical teaching he was an ardent advocate of the clinical method. His interest in pathological anatomy is shown by the numerous autopsy protocols in his writings, especially in his works on "Sudden Death" (1707), and "Aneurisms" (1738).

Lancisi described dilatation of the heart; traced the symptoms which follow it; described various types of vegetations on heart

valves and made the first recorded attempt at a logical classification of heart diseases based on etiology. He differentiated between traumatic and other aneurisms; was the first to advocate percussion over the sternum to determine dullness in the diagnosis of aneurism and was the first to trace the connection between aneurism and syphilis.

His essay on Swamp Emanations and their Cure (1717) will probably be best remembered. In this essay, Lancisi definitely traces the connection between swamp fevers and the mosquito, considers the possibility of infection by the bite of an infected insect causing "worms in the blood," but admits he cannot prove this hypothesis. From the nature of these fevers he is convinced of the connection between mosquitoes and the fevers, and asserts that if swamp emanations are responsible they are and must be organized and living emanations.

His cure, therefore, for swamp fevers is a system of drainage for the swampy lands and other methods including the planting of trees. A translation of portions of this essay as well as a bibliography will appear in the writer's article in *International Clinics*.

4. The Gods of the Underworld in Ancient Medicine. (Abstract.) (Lantern Slide Exhibit.) Dr. F. H. Garrison, Army Medical Museum, Washington, D. C.

The chthonian deities, of the earth and the underworld, exerted a profound influence upon Greek medicine in the pre-Homeric and pre-Hippocratic periods. The cult is obscure, is but vaguely adumbrated in the classical writers, and what we know of it is the work, not of medical historians, but of archæologists and classical philologists. The main source-book is Rohde's "Psyche." The *locus classicus* for medicine is the passage in the Hippocratic treatise "On the Sacred Disease" assigning the causation of insanity, epilepsy and other neuroses to "the plots of Hecate and the invasion of the Heroes." In the post-neolithic period (Cretan, Mycenean, Ægean), the chthonian gods were identical with Frazer's "Spirits of the Corn and the Wild," simple divinities of earth and agriculture, who promoted fertility of the soil, prosperity of crops and the general well-being of man. The aboriginal form was the chthonian aspect of the primordial *Magna Mater* or Mother-Goddess of Crete, Egypt and Babylon, who presided over obstetric functions. In the Homeric period, when cremation of the dead was substituted for shaft- and cyst-burial, the entrance of souls into Hades was conditioned by the rite of incineration (often with human sacrifice), the Chthonioi acquired infernal functions, thirsted for the blood of human sacrifice and were feared for their power to wreak evil and inflict disease, in particular the major neuroses. This was also a malignant power of the uncremated dead, who were part of the nightly swarm of evil spirits attending Hecate and Cerberus. Thus Plato (Phædrus, 244) attributes insanity to "ancient wrath" which Rohde interprets as the wrath of the long unburied or uncremated dead. The Greeks were blind to the fact of contagion and put up with the major epidemics as evidences of the wrath of the gods. What they feared were the major neuroses, as these were sometimes inflicted by the Olympian gods also; *e. g.*, in many of the dramas of Euripides, it is highly probable that certain Olympian and chthonian deities were merely identical gods in an uranic or celestial and a chthonic or infernal aspect respectively. Thus medicine in the pre-Hippocratic period was entirely prognostic and prophylactic. Prophylactic medicine was threefold: (1) Apotropaic, designed to *avert* disease by ritual sacrifice or other rites; (2) hilastic, designed to check or abort disease by rites of propitiation or atonement; (3) cathartic, designed to cast out disease invading the body by rites of lustration or purification. The human beings sacrificed in these rites were in time replaced by scapegoats (*Pharmakoi*) in the form of sacred animals and plants, edible, in the case of the Olympian gods, inedible in the case of the chthonian gods. As part of the mystic rite of entering into communion with the god or of "eating the god," the ritual plants and parts of the ritual animals partaken of by the worshippers at sacrifice came to have supposedly remedial functions. Thus a purely associative ritual therapy arose, which had no pharmaco-dynamic rationale whatever, but was simply based upon the mythologic relation between the god and the plant or animal dedicated to him. This is now true of the major part of the obsolete materia medica of Theophrastus, Dioscorides and Pliny. Max Höfler's tabulation of some 1254 ancient prescriptions of animal remedies goes to show that a part of the body of an animal was seldom employed for a disease of the same part, and even then only as a superstitious rite, since the Greeks knew nothing whatever of the lesions of visceral disease. The Greek scheme of vegetable materia medica was mainly mythological. Greek organotherapy was homœopathic magic, in Frazer's sense, but never real isotherapy in the sense of "like cures like."

Lantern Slides.

1. Aniconic and iconic figurations of the primordial *Magna Mater* or Mother-Goddess (Rhea) of Crete, surmounted by doves in her uranic aspect, attended by lions or entwined with serpents in her chthonic aspect (Sir Arthur Evans). The hieratic attitude of the votary, grasping serpents suggests "Making Medicine" (snake-dance of the Hopi Indians).

2. Babylonian Mother-Goddesses (Yale collections).

3. Christian symbolism of the dove (Rossetti).

4. Demeter chthonia, Kore (Persephone) and Triptolemus (Athenian bas-relief illustrating the Eleusinian mysteries).

5. Conventional Persephone (Rossetti). In her chthonic aspect; Persephone is always styled Kore (The Maiden) in the Greek.

6. Kore (Praxiteles).

7. Antique gems, representing Hermes Psychopompos, the "conductor of souls" (Furtwängler); the soul is represented as a butterfly on the shoulder of Hermes.

8. Eurydice summoned back to Hades by Hermes Psychopompos (Choragic relief at Naples).

9. The Alcestis, Thanatos and Hermes Psychopompos (Relief from the temple of Artemis at Ephesus).

10. Hypnos (Statue by Praxiteles).

11. Hypnos and Thanatos (Drawing by Simeon Solomon).

12. Hypnos and his mother Nux (Night) (Simeon Solomon).

13. Antique gems representing the hilastic rite of μασχαλισμός (Æschylus, Choephoræ, 439, Sophocles, Electra, 445), and the ritual sacrifice of a maiden for apotropaic purposes (Furtwängler).

14-18. Five stages in the progress of the Æsculapian tradition:

(a) Æsculapius in his aboriginal chthonic aspect as an ancient Thessalian earth- or cave-god, the *genius loci* of healing springs, shrines and temples, usually appearing as a serpent (*agathos daimon*) (Rohde).

(b) Æsculapius in the Homeric tradition as a mortal hero-physician of Thessaly, whose sons acted as naval and military surgeons in the Trojan war (Catalogue of the Ships).

(c) Æsculapius in the Pindaric tradition as a demi-god, the son of Apollo. Deified by a thunderbolt of Zeus, he assumes the celestial (uranic) aspect of the latter.

(d) Æsculapius in the later Greek tradition as a heroized physician (Heros Iatros), with a temple (Heroön) of his own near the Theseion at Athens (Demosthenes). Having assumed his mortal aspect again, his "grave" is shown in various places, and his descendants, the Asclepiads, have separate shrines of their own (Rohde).

(e) Æsculapius in the later Roman tradition reassumes his primordial chthonic aspect. He ends, as he began, as a serpent (Pliny, Nat. Hist. XXIX, 22; *Ovid*, Met. XV, 626-744).

19-30. Slides showing the serene, philosophic attitude of the ancients toward death as contrasted with the morbid mediæval view. In antiquity, the skeleton, when figured on gems or wine-

cups, was only a quizzical *memento mori*, the "skeleton at the feast" (Parkes Weber). In the Middle Ages and the Renaissance, it became the conventional sign and symbol of Death as the King of Terrors. The mediæval painters copied the spectral aspect (*Lemurengestalt*) of the eviscerated corpses and the dried skin-and-bone skeletal preparations (*Hautskelett*) in the MS. anatomical drawings (Sudhoff). The skeletons and eviscerated figure in The Books of Hours suggest that these were probably derived, in the first instance, from MS. anatomical illustrations by dissectors rather than from the imagination of the decorative artists. The Spanish painters represented royalties and great ladies as decomposing in their coffins. Rossetti's Beata Beatrix, an evocation of his dead wife, is un-English in conception. The feeling is mediæval Italian, that of Dante's *Vita Nuova*. The figure at the Adams tomb by St. Gaudens, in the cemetery in Rock Creek Park, D. C., according to the sculptor's intention, symbolizes Nirvana, the immobility or immobilization of the Orient.

THE LAENNEC SOCIETY.

MARCH 26, 1917.

X-Rays in Tuberculosis.

1. **The Roentgen Diagnosis of Pulmonary Tuberculosis.** DR. HENRY K. PANCOAST, Philadelphia, Pa.

2. **A Comparative Analysis of Roentgen Ray Pictures, Physical Signs and Symptoms in Pulmonary Tuberculosis.** DR. F. H. HEISE and MR. H. L. SAMPSON, Saranac Lake, N. Y.

DISCUSSION.

DR. F. H. BAETJER: I was glad to hear two notes sounded in the right terms in both these papers. The first, conservatism, and the second a note of cooperation. As one travels around the country and goes to a great many roentgenological laboratories, one is struck with the absolutely flat-footed diagnosis of tuberculosis from roentgenograms. My own feeling is that that is a mistake. We class tuberculosis down here as roentgenological tuberculosis and clinical tuberculosis. Roentgenological tuberculosis is, of course, of great interest to us, and clinical tuberculosis to the patient.

We know that in nearly all autopsies, if we look for it carefully, we find evidence of tuberculosis. If we have got evidence of tuberculosis from the anatomical standpoint, are we not going to get evidence in our plates? The question comes up, Is this tuberculosis we see in a plate of any significance as far as the patient is concerned? We frequently see coming up either from the wards or from the dispensary, lungs which in one sense might be termed fairly well shot to pieces by tuberculosis, although the patients may not have any temperature, may be doing their work, up and about. Now because we have found tuberculosis there, to say that that patient must go away and be treated would, of course, be an obvious error. In other words, it seems to me that tuberculosis is a clinical disease absolutely.

The roentgenogram can play a very important part in tuberculosis, as has been pointed out by the two speakers to-night. In the first place we can detect early permanent changes sooner than the clinician can. Understand me, I say permanent changes, not saying anything about the etiological factor in early incipient tuberculosis. I do not believe we are able to make a positive diagnosis. Of course the great difficulty is that the term incipient tuberculosis is used in different ways in different places. Quite recently a patient was referred to the roentgenological department, where we found consolidation and one or two small cavities in the right upper lobe. This case had been treated at a sanatorium here and came down with a diagnosis of incipient tuberculosis. The X-Ray was not needed in this case for diagnosis.

I do not believe we can make an etiological diagnosis in the earlier cases. If there are permanent changes, however, I believe the X-Rays are of value in pointing this out and we may suggest that we think it is tuberculosis. Tuberculosis does reach a stage when we can say "This is tuberculosis," but when that stage is reached the clinician does not need us to help him to make a diagnosis.

In regard to the question of chronicity and acuteness, the greater the amount of fibrous tissue we see in a lung means chronicity, and the greater involvement without fibrous increase means a more or less acute condition. The great difficulty is where we have a fibrous change with a flare-up on top of that. Can we tell anything about that? Personally, I do not think we can.

The other point the speakers to-night brought out is the question of cooperation. After all, what we are working for is the benefit of the patient and not to get something on the clinician or the roentgenologist. It is only by cooperation that we are going to get the very best results.

I should like to ask Dr. Heise something further in regard to his statement that in 17 per cent of his cases they found signs which were not found in the roentgenogram. Some time ago a number of students, presumably normal, were examined both clinically and from the roentgenological standpoint, Dr. Hamman, of course, making the clinical examination. Very careful notes were made and the field was limited almost entirely to the apices, because we thought the clinician has best opportunity there to detect small changes. It was quite interesting to note the agreement and disagreement. In some cases we agreed absolutely, and in others disagreed as to whether the change was in the right or left apex. The notes would read something like this: "Note on the right side possibly a little more blowing or high pitched." From these conclusions, one would say that the right side was involved and the left normal, although from a roentgenological standpoint we would sometimes find just the reverse. In other words, the physician would be at a loss to determine which of these two sides was normal, as he would have to depend entirely upon the comparison of the notes. In just such cases the roentgenogram would indicate which was the normal and which was the affected side.

DR. LOUIS HAMMAN: Fifteen years ago sanatorium physicians taught us that the results of treatment in pulmonary tuberculosis depended primarily upon the stage of the disease when treatment is begun. Under the influence of their indubitable demonstration clinicians have eagerly sought for aids to reach a definite diagnosis at the very earliest stage of the disease. Tuberculin for a time was vaunted as the sovereign means with which to reach an indisputable conclusion. Larger experience and critical analysis has not substantiated this extravagant claim for tuberculin. Later it was hoped that extreme finesse in percussion and auscultation would supply the necessary criteria. These arts have also failed us as conclusive arbiters. At the present time the enviable position left vacant by the failure of tuberculin and of percussion and auscultation to measure up to expectations is usurped by the roentgen ray. In many quarters roentgenograms or fluoroscopic pictures of the lungs are regarded as superior substitutes for the humbler methods of physical exploration, and some devotees of this branch of medicine are satisfied to settle all disputed questions upon the evidence of their art irrespective of other clinical data. This statement is daily illustrated in practice, for it is a common experience to have patients apply for a verification of the diagnosis of pulmonary tuberculosis when this diagnosis rests solely upon roentgenographic studies. We are all familiar with the judicious and conservative attitude taken towards this question by Dr. Baetjer, and it is very gratifying to learn that such prominent

investigators as are our visitors have come to similarly conservative conclusions. Expressions of opinion from these authorities will do much to check harmful exaggeration of the importance of the roentgen ray in the early diagnosis of pulmonary tuberculosis.

DR. HEISE: In regard to Dr. Baetjer's question, I would say that the changes were mainly those of breath sounds without râles. In one or two instances there were râles at the base.

APRIL 30, 1917.

Tuberculosis as a Social Problem.

1. **The Public Health Work of a Great Life Insurance Company.** DR. HORACE JOHN HOWK, Mt. McGregor, N. Y.

2. **The Social Service Side of Tuberculosis Work in New York.** DR. JAMES ALEXANDER MILLER, New York City.

BOOKS RECEIVED.

Care of Patients Undergoing Gynecologic and Abdominal Procedures Before, During and After Operation. By E. E. Montgomery, A. M., M. D., LL. D., F. A. C. S. Illustrated. 1916. 12°. 149 pages. W. B. Saunders Company, Philadelphia and London.

Focal Infection. The Lane Medical Lectures. By Frank Billings, Sc. D. (Harv.), M. D. Delivered on September 20, 21, 22, 23 and 24, 1915, Stanford University Medical School, San Francisco, California. 1916. 8°. 166 pages. D. Appleton & Co., New York and London.

A Manual of Nervous Diseases. By Irving J. Spear, M. D. With 172 illustrations. 1916. 16°. 660 pages. W. B. Saunders Company, Philadelphia and London.

A Treatise on Diseases of the Skin. For Advanced Students and Practitioners. By Henry W. Stelwagon, M. D., Ph. D. Eighth edition revised. With 356 text-illustrations and 33 colored and half-tone plates. 1916. 8°. 1309 pages. W. B. Saunders Company, Philadelphia and London.

The Diagnosis and Treatment of Abnormalities of Myocardial Function. With Special Reference to the Use of Graphic Methods. By T. Stuart Hart, A. M., M. D. Illustrated with 248 Engravings, 240 of which are original. 1917. 8°. 320 pages. The Rebman Company, New York.

The Clinical Diagnosis of Internal Diseases. In three volumes. By Lewellys F. Barker, M. D. (Tor.), LL. D. (Queens; McGill). Volume I (Parts I-VI) *General Diagnosis, Infections, Respiratory and Circulatory Systems.* Volume II (Parts VII-X) *The Blood, Digestive System and Urology.* Volume III (Parts XI-XIV) *Muscles, Bones and Joints, Nervous System, Metabolism.* 1916. 8°. D. Appleton & Co., New York and London.

The Harvey Lectures. Delivered under the auspices of the Harvey Society of New York, 1914-1915. By Prof. Frederick P. Gay, Dr. Thomas Lewis, F. R. C. P., Prof. A. S. Loevenhart, and others. Series X. 1915. 8°. 339 pages. J. B. Lippincott Company, Philadelphia and London.

AN APPEAL TO THE MEDICAL PROFESSION OF THE UNITED STATES.

The Surgeon General's Office has appealed to the medical press of this country for aid in securing the quota of physicians necessary for the care of the great army now in course of organization.

The Medical Departments of the Government are responsible for the examination of the recruits, the hygiene of camps and the care of the sick and wounded. The Surgeons General have not as yet been given full authority and the means to meet this responsibility.

The President and Congress can give the Surgeons General full authority and ample means, but except by the draft neither the President nor Congress is able to give them a sufficient number of men from the medical profession, as it is a volunteer service. Consequently, if the Medical Departments are furnished with the authority and the means, they will still be unable to do their work unless the medical profession of the country, and particularly the younger men, respond more freely than they have done up to this time.

In the army hospitals and first aid work abroad, in the vast concentration camps so soon to be organized in this country, and in every branch of the naval service there is an urgent demand for each physician who can and will offer his services. In the work our country has pledged itself to do, the need for doctors is imperative. Estimates give the figure of 20,000 physicians as the minimum number necessary for this work. Only about 6000 are at present enrolled. These figures speak for themselves.

Commissions in the Medical Reserve Corps are accorded on the basis of First Lieutenant, Captain and Major, with respective salaries of $2000, $2400 and $3000 a year. Applicants may apply directly to the various examining boards throughout the different states and complete all preliminary arrangements without reference to the Surgeon General's Office. The completed papers should be forwarded directly to the Surgeon General by the president of the examining board. A complete set of papers must contain the physical examination, report of the examiner as to mental, moral and physical qualifications, a personal history form filled out by the applicant and sworn to before a notary, and a certificate of state registration (except where this year's graduates have not had time to take their State Board examination). Two letters should also be sent certifying as to citizenship and moral qualifications, and, if of alien birth, a certificate of naturalization.

Further information may be obtained from the State and County Committees of National Defense, or directly from Surgeon General W. C. Gorgas, of the Army, or Surgeon General W. C. Braisted, of the Navy, Washington, D. C.